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Skating on Thin Ice

SLIGHTLY more than a year ago the correspondence between Secretary HOOVER and the Attorney-General resulted in a list of permissible and legal trade association activities. One statement therein, which later developments have served to emphasize, might have been liberally interpreted as follows: "Beware of the open-price scheme! On the surface it may seem legally feasible, but potentially it's dangerous business." That warning still holds. And another pillar was added to its support when the Supreme Court in its decision on June 4 against the linseed oil associates held that "their manifest purpose was to defeat the Sherman act without subjecting themselves to its penalties." If there has been any shadow of doubt in the mind of the conscientious trade association executive regarding the ethics of the open-price plan, this decision should forever dispel it.

It is significant that the warning in the Hoover-Daugherty correspondence was sounded in spite of the fact that Judge CARPENTER in the District Court at Chicago had already refused the government's request for an injunction against the Armstrong Bureau of Related Industries. The lower tribunal held that there was no actual restraint of trade and therefore no violation of the Sherman act, but the decision indicated the illegal potentialities of the organization. Apparently Mr. HOOVER either judged this opinion too frail to support a legitimate trade association activity or even at that time he saw how clearly the linseed decision was foreshadowed by the Supreme Court's stand against the open prices of the Hardwood Manufacturers' Association. It has since been pointed out that only a very small but conspicuous minority of the trade associations has fostered the open-price scheme. Probably 98 per cent of the commercial organizations of the country have acted in the public interest, while a meager 2 per cent have brought the whole into disrepute. We should not lose sight, however, of the fact that the trade organization is not the only guilty party.

The operations of the linseed associates, as far as the original bill of complaint shows, were always free and above board. Their strict rules for adherence to the "open competition plan" were obviously framed for the single purpose of maintaining uniform prices and a stable market, but at no time was there evidence of connivance or secret conspiracy at price fixing. That supposedly competing firms in more than one line of industry are actually fixing prices under cover is a matter of general belief, if not common knowledge. Nearly everyone has observed the fact that price changes may be announced simultaneously by all of the firms in a single industry. Sometimes even the wording of these announcements is strikingly similar; once we noted the peculiar coincidence that two of them received in the same mail included the same typographical error. The fact that many of these practices have been carried on unmolested for so long may have given some of these firms a false idea of security. They should recognize, however, that they are skating on thin ice and that sooner or later their schemes are certain to meet with disaster.

Once the friends of honest business and the supporters of the many constructive and useful activities of the trade association are aroused they are going to see that the government's continued warnings do not longer go unheeded.

Messrs. Gary et Al. Are Misinformed

A GREAT AMOUNT of public interest—judging from newspaper and magazine comment—has been excited by the report of the American Iron and Steel Institute committee on the proposed total elimination of the 12-hour day. It has even been asserted that the gentlemen who signed the report, Messrs. GARY, BLOCK, BURDEN, CAMPBELL, DINKEY, FARREL, GRACE, KING and TOPPINGS, do not believe what they signed when they say that the 12-hour day has not of itself been an injury to the employees, either physically, mentally or morally.

Now we haven't any sympathy for the 12-hour day. We have worked the long turn in the hottest part of a steel mill in the hottest of summer. In the remembrance of those days and nights, we are quite sure we should never have signed that report, even in the interest of harmony. However, that is no reason for doubting that the gentlemen who did sign it are absolutely sincere and believe what it sets forth. Furthermore, we do not hesitate to say that before the present situation can be remedied, it is absolutely necessary for the "reformers" to recognize the fact that the real men in the industry would not tolerate any condition which they knew was sapping their workers—no matter what the dividend situation or profit and loss account might be.

The trouble is they do not know! They get the basis for their opinion from officials, welfare worker, industrial investigators, or common spies, all "insiders." Little of this so-called "information" is in turn based on sincere, impartial investigation by a person who has risen from the ranks of the night shift, or even capable of imagining himself in the worker's job or herself in the wife's shoes. Outside investigators, strangely enough, are resented as meddling busybodies. And for this reason it is obviously impossible to convert the Iron and Steel Institute committee to the 8-hour day until

its members actually get the real information and from the inside.

How this may be done is difficult to say. Perhaps it would not be too much to suggest that Mr. GARY, for instance, should choose some rising young executive in the Carnegie Steel Co. of strapping physique who could stand the gaff, give him the job of furnace man's helper, require him to lose his identity for 6 months and live on his wages among his fellow workmen.

Then Mr. GARY would get a new basis for opinion—and from the inside!

An Integrated Society Convention

THE recent spring meeting of the Taylor Society was one of the most enjoyable affairs of this nature that it has ever been our fortune to attend. One came away from this convention stimulated—with a feeling that something of true worth had taken place in which it was a privilege to participate. Comparing this feeling with the reactions caused by many gatherings of a like nature, one is moved to question wherein the difference lay. The usual feeling one takes away from such a meeting is of a mind in chaos, overcrowded with a heterogeneous mass of ill-digested facts.

The difference is just this, and it is one that many other technical societies could well mark: The Taylor Society's program was a unit. It was composed of different subjects—true; but each of these subjects was so chosen that it threw a searchlight beam on the main topic. By the discussion of a series of closely coördinated parts of the management problem its significance to industry was placed in a clearer and better light for all who attended.

Turning Refuse Into Money

THE FORWARD MARCH of technology prompts an occasional stock-taking of current terms. In the Chicago packing plants, we are told, all but the squeal is utilized; there is no waste. The refuse of today is the raw material of tomorrow. Hence one is forced to admit that the term "utilization of waste" is a misnomer, because the process or processes involved have become an integral part of industrial operation. The ideal manufacturing plant discards nothing; there is no refuse to throw away.

The scientist and his confrère, the expert technologist, delight to "make a job" of anything; and in this respect it is pertinent to review the profound influence of chemical engineering in recent years on the completeness of utilization of raw material or the byproducts of industry, no matter of what kind. The field for invention and initiative has been extensive, and advantage has been taken of its potentialities by a Californian corporation, headed by STANLEY HILLER, who appears to have an unusually keen sense of the economics of industrial effort and the latent value of what is usually considered as refuse. His researches and the practical application of his ideas on the manufacture of valuable byproducts from fruit pits during the war led to the establishment of an industry of no small proportions in the West. Concurrently, a study of conditions in the canning industry suggested an investigation into the losses of valuable liquors, with the result that he developed a unit plant, which collects and treats and clarifies what was previously thrown away, thus adding appreciably to the profits of the undertaking.

Fish curing and marketing has assumed immense proportions, especially in the Pacific Coast region. An idea of its importance may be gathered by considering the potential value of the material that has been discarded as valueless—the heads, tails and entrails—amounting to about 35 per cent of the weight of the catch. Mr. HILLER has developed a neat and compact treater, in which such refuse is chopped, cooked, deprived of oil, dried and ground. It is then sold as a chicken feed or fertilizer material. The oil recovered finds a ready market for a large number of purposes.

It's the little things that count. The scientifically complete utilization of all the raw material that Nature has provided, as well as of the residues and byproducts of normal manufacturing processes, indicates that we may be entering a new phase of industrial efficiency. The ability to apply such refinements in a practicable manner emphasizes the importance of large-scale operations and the value of technical control of the highest standard. Mr. HILLER'S successful work on the coast suggests another grouping of engineers—those who specialize in the work of turning waste products into assets of dividend value.

The Technical Man And His Job

NOTHING strikes nearer home to the technical man than a discussion of his job and his good relations with his employer. While he may be concerned primarily with his own efforts to improve his individual status, nevertheless anything that affects the standing of his profession is bound to have his attention. It is, therefore, to a peculiarly receptive audience that one of our readers has addressed the letter on page 1081 of this issue, which bears the title: "Is There an Agreement Against Technology?" He describes a condition which, if at all prevalent, would have a most unfavorable reaction on the chemical profession.

We believe it safe to say, however, that fortunately only a small minority of our manufacturers are a party to this "gentlemen's agreement" not to engage a technical expert who has left the employ of a competitor. The apparent effect of such a vicious practice would be to enable the manufacturer to carry on research up to a point where he has improved his product and established economic production and then to sit safely by and take his profits without fear of competition. A short-sighted policy, to be sure, but one likely to attract the opportunist. The effect on the technical man, on the other hand, would be to enslave him in his present position, or, if he loses that, force him into a different line of work in order to gain his livelihood. By thus narrowing the market in which the technical man can sell his special abilities, this practice takes away the incentive that makes for really worth-while research.

A somewhat parallel situation exists in the case of the unfair contracts which a few employers still exact from their technical men. These coercive contracts, entirely unilateral in character, would claim as the manufacturer's property all of the knowledge and experience gained by the technical man during the term of his employment. In spite of the fact that the courts have been called upon to iron out some of these difficulties and have succeeded in establishing some fairly definite

precedents, the practice still persists and these oppressive compacts are constantly held over the heads of some of our technical men.

The contract evil as well as the employing agreements stressed by our correspondent will not be corrected as long as the technical men submit to these injustices. There must be a more general recognition of the chemical and engineering professions and the chemist and engineer must win for themselves the same respect and trust that are now accorded the legal and medical professions. The responsibility for bringing about these changes is in the hands of the technical men themselves. Our reader's protest is a step in that direction.

The Flat Tire Of Industry

NOT LONG AGO an acquaintance said that finance was the flat tire of industry. This may sound like a rather flippant thought, but it was really a headline to call attention to the very sound truths lined up beneath it. It is perhaps too often the case that those industries with banking control are the most poorly managed and the least integrated.

This was the thought in our acquaintance's mind when he made that remark. He, like most of us, had seen the operating and the distribution departments of a manufacturing plant formulate the best of plans, more often than not with the full cognizance of the banking control, only to have the whole structure overturned at some later date for a purely financial reason. And he knew that in plants where the control lay in the plant and not in the bank, plans were made and carried through with respect to industrial, not financial, considerations.

But this wrecking of plans need not occur. Does not all modern industry base its plans on the plant budget? Suppose, then, that the banking control sits in on the budget making and then holds to the budget made. That's good financial practice as well as good industrial practice. And if such a course is followed, don't you think that the one-time flat tire will be reinflated—a sound wheel once again for our industrial machine?

Sizing Up The New Graduate

INDUSTRY has little concern with the "sweet girl graduate" of June, but in the large group of technical and scientific men now leaving our colleges and universities the chemical engineering industries do find each year a new source of inspiration and an ever new set of problems.

The young man upon graduation often feels that his scholastic record will of itself mean much. In a sense this is true, although industry also has other bases of judgment. And even the professors who have for 4 years consistently drilled into the young man the importance of high scholastic standing appreciate how many other factors must enter into the appraisal of his service value. This view is conspicuously apparent in an employment qualification record used by the department of chemistry at the University of Wisconsin. This record serves to assist the department head in answering requests from industry for young men of promise and in turn aids the graduates in obtaining work for which they are particularly qualified.

This record of qualifications cites twelve factors which form the background for the confidential estimate made by the faculty committee for each individual graduate. Integrity, quite properly, is the first requirement. It is followed in turn by personality, application, initiative, personal appearance, health, habits, attitude toward work, and co-operative spirit. Not until the tenth item in this estimate does one find the entry "scholastic record"; and it is followed only by two items of rather doubtful value—namely, "probable success" and "experience." This should be a most striking evidence to the young man that many factors enter into his rating as a prospective member of the profession in addition to the class standing, on which so much emphasis is placed during his collegiate experience.

Breaking Him In

BUT there is another side to the case. Industry is confronted with a responsibility to the young men that come to it fresh from college filled with enthusiasm and ambition. Many if not most of them are ambitious beyond their powers of immediate accomplishment. It is of greatest importance that this ambition be curbed and this enthusiasm be directed into useful channels, although, of course, without the destruction of either.

One employer of our acquaintance has a course of cadet training for the young men whom he employs fresh from college. For a time at least most firms must use these youngsters in more or less routine fashion as aids in the various branches of the business. Moreover, it is commonly if not generally necessary to try them out in several departments before final judgment can be reached as to their place of greatest promise and usefulness.

In this post-graduate service the manager who is responsible for supervision of the young men must be peculiarly tactful or he will unwittingly destroy a most valuable asset—that of loyalty and enthusiasm for the organization as a whole. One instance, where serious results almost came to pass through misunderstanding, affords excellent warning to all employers. In that case a young man splendidly trained and of fine personality was made a cadet engineer in a large corporation of national scope. He was moved about from one department to another at frequent intervals and finally he became thoroughly discouraged. This happened because, as he puts it, he was never left alone long enough to do anything by himself. As soon as he found out what the particular job meant he was moved on to something else. The whole trouble lay in the fact that the young man did not understand the purpose of the movements. He thought they resulted from dissatisfaction with the service that he rendered, whereas, as a matter of fact, the very frequency with which he was moved was the best evidence he could get of the appreciation of the promptness with which he grasped each new situation. He was simply being given an opportunity to learn many phases of the business before being assigned his own particular niche to fill.

Industry has a responsibility in the training of these new hands. If by co-operation and understanding the management and the inexperienced apprentice can work together during this trying period, the results are bound to be of mutual value and satisfaction.

An Engineering Inaugural

Memorable in Itself, but Even More Memorable Because of the Great Composite Expression of the Faith of the Engineer

THE inauguration of Samuel Wesley Stratton as president of the Massachusetts Institute of Technology was more than an important academic event. It had greater significance than the induction of a strong proper leader as head of a great engineering school. It marked the expression of a faith that was vigorous, indomitable, inspiring. It was the challenge of the engineer for progress and peace.

This keynote found expression from many tongues. Dr. Stratton himself in his inaugural address selected as his text the famous line from Pliny's "Natural History, "*Alia initia e fine*. This he translated most happily, "Every finish marks a fresh start." The phrase, most appropriately carved in the office of the president at the Institute, represents perfectly the progress of science in general, and with it as a pointer Dr. Stratton painted a vivid picture of the effect of science on the evolution of the great industries of today—steam transportation, electric power, the automobile, aëronautics, electric communication. Step by step the engineer has forged ahead from the beginnings that now seem ludicrous, aided by the chemist, the physicist and the mathematician, until the present industrial perfection has been achieved. And this perfection is but a beginning, for *alia initia e fine* is not a mere catch phrase. It is in the blood of the engineer.

Before Dr. Stratton's inaugural address many distinguished men, representing many phases of contact between the president and the Institute and commemorating his achievements as creator and head of the Bureau of Standards, brought messages of greeting. Through them all rang a note of confidence—confidence that with men like Stratton in schools like the Institute the engineers of the future will be equipped to lead this nation and the world through paths of safety and progress.

A distinguished engineer, Prof. C.-E. A. Winslow of Yale, speaking for the alumni of the Institute, has given inspiring expression. "To us alumni of the Institute, the essential thing about the Institute, the thing that we hold so dear, is the spirit of science.

Samuel Wesley Stratton

Inaugurated as president of the Massachusetts Institute of Technology on June 11. As creator and head of the national Bureau of Standards, Dr. Stratton has won for himself an enviable position among the technologists and scientists of the world.

We want that spirit to have, through the work of the Institute and its alumni, the widest possible fruition. The problems of the purely material universe have been very largely solved during the past century. The great problems of the next century are of a different nature. They are problems of human relationship.

"The things that are wrong in the world today are the relationships between classes and the relationships between nations, and those difficulties are, I believe, to be solved by the spirit of applied science. That spirit means, first of all, honesty—intellectual honesty in facing the facts of any given situation. We do not build bridges by the methods of Coué. We calculate the stresses and the strains, and we attempt, as closely as possible, to visualize the load that bridge will have to bear. We need that spirit in dealing with these less tangible things. And when we have faced the facts as they are, we need then the courage and the confidence with which the engineer deals with his problems.

"If, as representing the alumni this morning, I have any wish for this Institute which Dr. Stratton is to carry on, it is that the young men who come here may fully realize the potency of this talisman of the scientific spirit, that they may not be merely engineers but citizens, and citizens not merely of America but of the world. And thus the torch which Dr. Stratton takes up today from the unseen hands of Maclaurin and Walker and Rogers may illumine all the dark places along that difficult road which leads onward—a world of order and of progress and of peace."

One more message to round out the picture! John Campbell Merriam, president of the Carnegie Institution of Washington, brought clearly to the front the responsibility of educators to develop in men a type of thinking that shall be free from prejudice and illusion and that shall be satisfied only with truth—truth, which, Swinburne says, "looks into the pit of hell and is not afraid."

"If this great country is to succeed in the continuing organization of its economic and political relations, it will be on the basis of clearly substantiated facts interpreted by a philosophy that expresses the true laws operating in human conduct. It is only by education in the kind of straight, clear, fearless thinking that characterizes the work of the scholar and investigator—plus the unselfish determination to accept facts where we find them—that we can keep on the upward path."

How the Railless Railroad *Solves the Unskilled Labor Problem*

BY MATTHEW WILLIAM POTTS
Consulting Engineer, New York City

Tractor and trailer transportation eliminates man-handling around the plant. It gives the advantage of hauling long trains without the necessity of following any given path.

Hauling barrels loaded on trailers over wooden runways. Concrete runways are a better investment, as they eliminate considerable maintenance troubles.

IN the daily newspapers and technical publications of the country we read about the present shortage of cheap labor needed to perform the manual work of handling materials in various industries. Executives seem to agree that the 3 per cent immigration law must be raised in order to supply more manual laborers. How many of these same executives have given serious consideration to the use of material-handling equipment as a means of providing the necessary power to move materials in industries?

Man-power is a deceptively expensive luxury. Chinese coolies laboring for a few cents a day cannot develop power as cheaply as the American motor of either electric or gasoline drive. American mechanical power costs only a fraction of Chinese coolie-power. In addition, the use of this mechanical power increases the efficiency of the plant, because it is not subject to labor turnover.

In spite of this truth, there are still thousands of individual companies whose executives extravagantly employ man-power for the internal handling of incoming and outgoing freight, raw materials, parts and finished products. In addition to wasting needed man-power, these companies, almost without exception, are showing too high operating cost and too narrow profit margin.

The man on the hand or push truck and the gang carrying a load by hand—whether in industrial plant, storage yard, warehouse, freight platform, passenger terminal or pier-shed—are heavy penalties on profits. Power does the job more cheaply.

The shrewd executive, seeking economy or cheap labor, can adopt few better tactics than to work out a way to apply tractors and trailers to his material-handling problems. Haulage is the backbone of virtually every industry. Unless raw materials, parts, finished products, supplies and freight move smoothly and on schedule to the point of need, the whole operating schedule breaks down, with an expensive waste due to labor time, idle equipment and all the far-reaching effects resulting from any upset of routine.

Is the solution of this labor shortage to be found in allowing more immigrants to enter the country? No. Why? Because the second generation of these immigrants are not satisfied to be common laborers; they have been educated in our public schools and they imbibe the same ideas that our own native children do and they desire to be in the skilled and not the unskilled labor class. Even the newcomers won't stay unskilled long.

HOW THE TRACTOR HELPS

The answer to the labor shortage is not a change in the laws that will mean only a temporary solution, but more extensive use of labor-saving devices (a better name would be labor-conserving devices) and machines to do the work of common labor. When we had a shortage in the field of skilled mechanics the development of automatic machines to do the work was speeded up. The same is true of the farm labor shortage, which was met by a more extensive use of farm machinery.

To make a mere play of words and to offer no concrete evidence in any discussion, especially in one so important as the present immigration question, is not productive of constructive improvements. For this reason I have taken the subject of tractors and trailers to illustrate the results that can be obtained by the more extensive use of material-handling equipment in industries and to point out how common labor can be obtained cheaper, quicker and better by installing this equipment than by changing the present 3 per cent immigration law.

Assuming 10 tons as a tractor load, a single machine replaces 40 hand-truckers handling 500 lb. each. By proper routing, with a drop-and-pick-up system of trailer-trains, a tractor can be kept almost continuously in action under load. Given the proper application, the tractor is the greatest labor conserver in the industrial vehicle family. Each tractor may be provided with three trains of trailers, ranging from five to ten trailers in length; thus all idle time in loading and unloading is consumed by the trailers only, the tractor uncoupling and passing on to the next job.

The tractor-trailer methods are frequently called "railless railroads" in order to differentiate between the original industrial railroad, which required rails on which to operate, and the present system of industrial railroads, which operate without rails. The feature of operating without being confined to one set line of travel has done much to bring about the great savings in money, time and space that can be effected by installing tractors and trailers. The constant changes in

methods of production make it imperative for the industrial transportation system to be adaptable quickly to new routes and conditions without incurring loss of time or additional money expenditure. As the electric or the gasoline tractor and its train of trailers can change its route at a moment's notice, it has all the advantages obtained by hauling long trains of materials, but none of the disadvantages caused by being confined to a given track or route which cannot be deviated from at will.

The term "railroad" is retained because the tractor-trailer equipment is in many ways similar to the equipment used on the steam railroads. First, we have the tractor, which is really the locomotive. Second, we have the trailers, which represent the cars and of which there are many styles and types to meet the need of the materials to be handled and the road conditions. Third, if the system is to operate successfully in any large plant, it is necessary to have a dispatch system and a centralized control of all equipment. Installing an industrial transportation system is not a hit-or-miss proposition, but is one that requires considerable thought on the original installation and close attention to the operating details.

Advantages of Using Tractors

Some of the advantages obtained by the use of a tractor-trailer system of industrial transportation, when compared to manual-handling, are:

1. Reduced number of men on the payroll.
2. Cheaper operating costs.
3. Quicker and better deliveries of materials between operations.
4. Complete co-operation between departments.
5. Increased production.
6. Reduction of labor troubles.
7. Reduction in labor turnover.
8. Reduction in amount of materials and parts damaged in transfer from operation to operation.
9. Better working conditions.
10. There are numerous others, such as assisting in distributing costs of handling by departments instead of placing it as an overhead item, providing a means of checking up the weak spots in the organization, etc.

The number of advantages depends upon the amount of attention paid to the system and the human element which operates it. By this I mean that if the system is operated with a common laborer as its directing head the results will not be as gratifying as if an intelligent and able man were placed in charge. Few railroads are operated by their common labor, and this same rule should apply to the tractor-trailer railroad in industry.

The writer has often analyzed the transportation problems of plants, with a view to improving the present methods of handling materials. Quite often it has been recommended that a tractor-trailer system be installed. If no equipment but common stevedore hand trucks are being used in the plant, it frequently necessitates the purchase of considerable new equipment. Many times the recommendation has been turned down because the executive did not know what it was costing him to handle materials with his present equipment and he did not take sufficient interest to have his own force find out the cost or wish to permit an outsider to determine it for him.

In other instances the present costs have been determined, but the initial investment has appeared too large; and the difficulty of obtaining such a large appropriation has deferred the installation of the system. It is now my practice, and I strongly recommend this method of procedure to salesmen and executives, to take one step of the problem at a time and segregate it so that after its successful solution it will be possible to take the next step without having to alter the first.

This method necessitates making a complete study of the problem and laying down a definite program. Gradual development will always prove the soundness of the complete system. The first step is to make a layout of the plant, showing all the points where it is necessary to deliver and pick up materials. The second step should be to analyze this layout to determine where the strategic points really are—in other words, where the natural flow of materials comes together. In this way it is often possible to make slight alterations in the delivery and pick-up points so as to save considerable time on each tractor trip and to cut down the length of haul. This new layout can immediately be put into service with the present equipment and it will automatically prove itself.

It is often necessary when first installing tractor-trailer systems to build up a "right of way" for the trains. This leads to the formation of a "maintenance of way" crew which will later form the nucleus of the transportation department. The building of

Fig. 1—Electric tractor hauling fifth wheel trailer over rough earth floor of foundry.

the right of way frequently saves money by making immediate improvements in the general yard condition, eliminating delays due to the truckers getting stuck and other familiar causes that lead to expense.

After the "right of way" is established one tractor and twelve trailers will form a good combination for the first purchase of equipment. This equipment in actual operation will decide what additional equipment should be purchased. Again the similarity of the tractor-trailer system to the common freight-handling railroad becomes apparent. Each tractor unit must be supplied with at least a 12 to 1 ratio of trailers if it is to be operated economically and efficiently. This is like supplying the railroad locomotive with cars. The type of trailers should be standardized as to wheels, bearings and connecting hitch; but the superstructure or frame can be made to suit the materials to be handled. There is so much lining up of trainloads, cutting out of cars (trailers) here and there, backing and hauling about that anything but a universal coupler would be a serious drawback. By standardizing the wheels and bearings it is possible to carry a small stock for making minor repairs without tying up the trailer entirely. Thus a bearing can be removed from any wheel and a new one slipped into place while the old one is being repaired. The same is true about repair to wheels.

As the system is put into actual operating practice it will slowly enlarge until the entire handling is taken care of. At this point the dispatching of the equipment will have reached such proportions that it will be necessary to have a superintendent of transportation, whose duty it will be to keep a general oversight of everything connected with the transfer of materials—the men, trucks, paperwork, pavements, all costs. To him is also relegated the duty of devising or passing upon proposed improvements. Minor changes for the betterment of the system should be constantly presenting themselves.

If records have been kept from the beginning of the study of plant transportation, it will be seen that each step pays for itself and the profits made will carry the initial investment. In order to illustrate what can be done, by showing what has been done, the writer will cite a few instances of successful tractor-trailer installations that have paid for themselves and are still continuing to show a large profit over the old methods.

In the Minneapolis Steel & Machinery Co., Minneapolis, Minn., it was found that with the old method of horse-and-wagon intraplant transportation, the cost of handling materials was $1.50 per ton, and it required forty-seven men plus fourteen teams and wagons to perform the operation—which was none too good. In 1917, the company investigated and started to install a tractor-trailer system of transportation. In 1919, the installation had been completed and it was found that fourteen men, three storage battery tractors, fifty-three small trailers, four 4-ton trailers, and two of 2½-ton capacity, a motor truck popularly known as the "jitney" and power-lift transfer trucks, which handled materials in the shops, could handle all the company's materials. The cost had been reduced to 30 cents per ton, and from 50 to 100 per cent more tonnage was handled by the new equipment. This saving of $1.20 per ton handled make an aggregate saving of $200 per day in handling cost alone. It did not require many days' operation to pay for the installation.

In order to show how these fourteen men were distributed, I will give a brief description of the transportation organization. There is a superintendent of transportation, a chief dispatcher, an assistant chief dispatcher, five division dispatchers, four tractor drivers and two men to operate the "jitney" service.

When we consider that forty-seven men were originally required to do the work of these fourteen, it is amazing, and the result of this saving of man-power effected a release of thirty-three men for other work that could not be performed by machine equipment. It will be noted that eight of the fourteen men are required to direct the system. This means that all the heavy work is taken out of the transportation department.

In addition to handling the materials within the plant, these fourteen men, or rather the eight men that direct the department, also keep all records of cost for handling materials, and furnish a complete record of when

Fig. 2 (above)—Old method of handling raw material at Armour Glue Works in Chicago. How would you like to push one of these trucks for an 8-hour day?

Fig. 3 (below)—Present method of handling raw material at Armour Glue Works in Chicago by tractor-trailer system, handling three times the amount at one-third the expense, with better working conditions for all.

and how the materials were delivered to each department. This information proves very valuable in establishing cost figures.

Tractors in a Chemical Plant

In the plant of a large chemical industry, the use of a tractor-trailer train for handling refuse to the dump pile, for handling salt among the departments, for handling ground sulphur, ice, etc., effected a material saving in time and money, as well as speeding up the production schedule.

There is a tendency on the part of chemical plant executives to feel that their continual change in processes and the use of the same apparatus for making different products make it impossible for them to lay out a route for a tractor-trailer system. This is not correct, because the tractor-trailer system is very flexible. Its line of travel can be changed at a moment's notice, and it is not limited to any one path, as it will negotiate all turns and straight runs that are as wide as the widest part of the train.

This is clearly illustrated in Fig. 1, where the tractor is operated on the dirt floor of a foundry, pulling a train of trailers.

The chemical plant executives also feel that their present hand equipment would have to be scrapped if they were to install the tractor-trailer methods. In the plant of the Armour Glue Works, at Chicago, the raw material used to be handled in hand "buggies" as shown in Fig. 2, and it required two husky men to propel these buggies when loaded. After a tractor had been installed for other purposes it was decided that this operation could be more profitably performed by using a tractor-trailer system. With the slight change in design as shown in Fig. 3, the old equipment became a part of the new tractor-trailer methods, and now one man and a tractor will handle from three to five loaded buggies in one train, with ease.

The method of placing barrels on trailers is shown in the headpiece, and it is often profitable to use wooden runways, provided no heavier trucking than the tractor trailer trucking is done over them.

Now is the time, during the present labor shortage, to make the greatest use of material-handling equipment, and the tractor-trailer methods should prove of interest to chemical plant executives. They will find that by investigating these methods and installing them in their plants, they will not only overcome the labor shortage but they will also reduce their operating expenses, thereby increasing the profits on their goods.

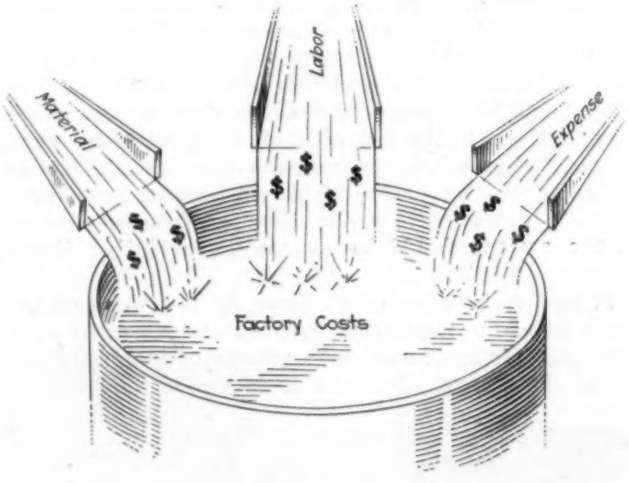
A Gage of Purchasing Efficiency

An Accounting Method That Enables Executives to Judge the Purchasing Agent and His Judgment of Markets

TWO important factors indicating effective control of manufacturing cost systems are frequently neglected in the design and subsequently in the installation of otherwise excellent systems. The first is the provision for that control which will unquestionably reflect the ability of the purchaser of materials used in the process of manufacture. Is he foreseeing rising and declining markets? And if so, to what extent is the concern benefiting thereby? Considering the large element of material costs entering into the manufacture of most products, it is a continual surprise that more manufacturers do not avail themselves of effective means to control such an important phase of their business.

The features enumerated in the following paragraphs are selected from a system in use by a concern the sales of which run into the millions, and which has branches all over the world and an annual turnover of raw materials of well over twenty. It is easy to see the disastrous results of unwise purchases made repeatedly as is the case when turnovers average more than one per month. The three elements of factory costs—material, labor and factory expense or burden—are thrown together into a factory much as cement, sand and stone are thrown into a concrete mixer.

After a definite length of time, due to effective management, certain products may be expected from the factory in sufficient quantities and of the required quality, ready for distribution to the customer direct or to the branches, as the case may be. These are the facts common to every manufacturer. The recording of the facts in such form as to be of the greatest assistance to the manufacturer varies, however, in nearly every



plant. Some are good and some are not. There are certain well-known methods used by the accounting department to collect the three elements of cost and then to differentiate them to the various classifications under each element. If the voucher register is used, a column may be headed "Factory Ledger," into which all the elements of cost are thrown. This account in the general ledger is the factory control account. It is debited or charged with the total amount of material, labor and factory expense going in to make up the product and is credited with the finished product which is shipped or transferred from the factory. The balance of this account represents the value of the material, labor and factory expense still in the factory either in the form of raw material, work in process or finished goods and therefore is an inventory account.

The factory ledger, a subsidiary ledger, will further classify material, labor and factory expense into additional accounts depending upon the refinement and detail required. It will also contain the following accounts: Factory Inventory, General Stores Adjustment, Manufactured Goods, Cost of Factory Shipments.

Physical inventories should be taken at the factory periodically and should always be priced at cost or market, whichever is lower.

Under the material classification the General Stores account and the Material Used account should be set up as separate accounts, the latter subdivided into the different departments. When the cost of all raw material purchased plus transportation charges have been debited to the General Stores account at the end of the period, the account will have the following appearance:

Debit	Credit
Jan. 31—Purchases ...1000	

The materials used in process of manufacture are collected and classified by products and departments. The totals for the departments are the basis for postings to the debit of the Manufactured Goods account and to the credit of the Materials Used accounts. In pricing materials used, always use *current market prices.*

Every manufacturing department is held up to a back-breaking efficiency because it is easy to calculate the production that should be obtained and compare it with actual accomplishments. Here is a way of doing the same thing with the purchasing department and no one will welcome it more than the efficient purchasing agent.

The balance of each of the Materials Used Accounts are closed at end of period by transfer to the General debited) the General Stores account will be shown thus:

Debit	Credit
Jan. 31—Purchases ...1000	Jan. 31—Used 800

If the amount of inventory on hand at the beginning of the period is now transferred from the Inventory account and the amount of inventory at close of period is credited to this account (Inventory account being debited) the General Stores account will be shown thus:

Debit	Credit
Jan. 31—Purchases ...1000	Jan. 31—Used 800
Jan. 1—Inv. beginning 600	Jan. 31—Inv. close 900

If cost and market price remained the same the above 800, indicating materials used, instead of this amount would be 700, with the result that the account would balance. However, in purchasing materials, a rise in market value was foreseen so that when the materials used were priced, it was found that the market was 800 on what had been purchased at 700, or that a profit of 100 had been made.

It is not the major purpose, of course, for the factory to make profits on material purchases. If such is the purpose, the term "factory" is a misnomer and should be relegated for that of "Jobber." On the other hand, the factory should not incur a loss in its material purchases.

The above credit balance of 100 at the end of the first month's operations should not be used as a basis for immediately formulating any judgment relative to the efficiency of the purchasing department. It will be only after 3 or more months, in which time the balance may alternate from credit to debit, that this account will indicate a positive trend. It is advisable to set up an account to which this balance can be transferred monthly. This account may be called Inventory Adjustment account or General Stores Adjustment account or some similar name. It is, however, a Profit and Loss account and must be treated as such at the end of the year.

The above brings out the first point under discussion. *A credit balance in the General Stores Adjustment account after a certain period will clearly indicate, if inventory and materials used are properly priced, that the purchaser of materials is skillfully making his purchases, while a continued debit balance will just as surely indicate the reverse condition.* With large turnovers it doesn't require much of a loss per turnover to run the accumulated totals into a considerable debit balance. The method of collecting labor and expense and subsequently transferring them to the Manufactured Goods account is only a matter of routine. The balance of the Manufactured Goods account, after inventories have been considered, is transferred to the Cost of Factory Shipments account in the factory ledger, which in turn is transferred as a credit to the Factory Ledger account in the general ledger. When the Factory Ledger account is credited with the actual cost of factory shipments or transfers an account called Manufacturing account in the general ledger is debited therewith.

Impurities in Battery Electrolytes

The importance of obtaining information concerning the action of impurities in storage battery electrolytes arises from the detrimental effects which many of them produce on the operating characteristics and life of the storage battery. Such information is necessary as a basis for the preparation of specifications covering sulphuric acid for use in batteries. A new method of measuring the rate of sulphation of storage battery plates was recently devised at the Bureau of Standards.

It was found that the presence of 1 part in 10,000,000 of platinum in the electrolyte increases the local action at the negative plates 50 per cent; the effect of copper is much less, while the effect of iron is of unusual interest because of its accelerating action at the negative plates. Manganese deposits upon the positive plates in the form of manganese dioxide which covers the active material, closes the pores and causes a large waste of current.

Cooling of Steel Gages

A recent progress report to the gage steel committee, Bureau of Standards, notes that the temperature distribution in a round bar of metal in the quenching bath has been studied.

It has been demonstrated by experiment that in water cooling, the surface is cooled to below 100 deg. C. in 2 seconds, while the center of a 1-in. bar has cooled less than 20 deg. C. In 10 seconds the center has cooled half way, but it is evident that gage specimens cannot be hardened in water and withdrawn before cold for slower cooling through the transformation, without the surface region having already passed that change.

In oil, the center cools half way in 17 seconds with a large temperature gradient which decreases rapidly thereafter, so that the specimen can be withdrawn from the bath when entirely above the hardening change without danger of softening.

The Air Slaking of Lime

The Rate of Deterioration as Well as the Kind of Deterioration of Siliceous, Magnesium and High-Calcium Lime When Exposed to Air Has Been Studied and Is Discussed in This Paper

BY F. H. RHODES,* W. H. JONES AND W. R. DOUGAN

IT IS well known that the essential reactions involved in the slaking of quicklime in air are:

a. The absorption of water vapor by the calcium oxide, with the formation of calcium hydroxide, and

b. The absorption of carbon dioxide by the calcium hydroxide (or oxide) with the formation of calcium carbonate.

Gray[1] and Levi and Orthmann[2] state that the absorption of moisture by quicklime proceeds much more rapidly than does the absorption of carbon dioxide. Whetzel[3] found that high-calcium limes take up moisture more rapidly than do magnesium limes; while the carbonation of magnesium limes takes place more rapidly at first and then more slowly than does the carbonation of the high-calcium limes.

The work described in this present article was undertaken for the purpose of obtaining more exact information as to the relative rates of the reactions which take place when quicklime is exposed to air, and as to the manner and extent to which these reactions are influenced by the impurities normally present in commercial limes.

The samples of lime used in these experiments were obtained through the courtesy of Dr. M. E. Holmes of the National Lime Association. These samples analyzed as shown in Table I.

The calcium oxide, magnesium oxide, silica, alumina, ferric oxide and carbon dioxide were determined by No. C 25-22 T of the American Society for Testing Materials. The water content was calculated as the difference between the percentage of loss on ignition and the percentage of carbon dioxide. The available calcium oxide was determined by the sucrose method.

TABLE I—ANALYSES OF LIMES USED

Sample No.	% CaO	% MgO	% SiO_2	% Al_2O_3	% Fe_2O_3	% CO_2	% H_2O	% Avail. Lime	Remarks
5	96.97	1.10	0.41	0.11		0.00	1.37	94.06	.....
44	98.36	0.22	0.11	0.21		0.22	1.01	94.28	High-calcium lime from oölitic limestone.
111	53.92	43.01	2.42	0.61		0.00	0.42	30.19	High-magnesia lime from dolomitic stone.
65	55.84	41.22	1.08	0.48	0.52	0.22	0.64	45.17	High-magnesia lime from dolomitic stone.
34	88.22	6.19	2.31	0.42	1.14	1.12	0.42	70.10	.....
53	93.18	1.22	1.84	0.91	0.24	1.40	1.01	68.21	.....
63	97.22	0.51	0.14	0.56		0.14	1.20	95.11	High-calcium lime.

A preliminary experiment was made to determine the rate of slaking of relatively pure lime. About 2 lb. of lime No. 5 (96.97 per cent CaO) was broken to lumps about 2 in. in diameter, while a second sample was ground to pass a 50-mesh sieve. Each portion was spread out in a large porcelain dish and exposed to circulating outdoor air, under sufficient cover to keep off rain and snow. Each lot was stirred frequently to expose fresh surface. At intervals, samples were taken from each lot, care being observed to obtain samples which were as nearly as possible representative of the average mass of the material. In each such sample carbon dioxide, water and active calcium oxide were determined. These results are shown graphically in Figs. 1 and 2. These figures also show the mean temperatures and mean relative humidities of the air, in 5-day periods, for the times during which the samples were exposed.

The results obtained for the rate of change of water content are rather interesting. In each case the moisture content increased rapidly at first until substan-

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[1] "Influence of Moist Air on Quicklime," *Jour. Chem. Met. Soc. S. Africa*, vol. 9, p. 396.

[2] "The Action of Air on Lime," *Jour. Am. Leather Chemists' Assoc.*, vol. 6, p. 593.

[3] "Effect of Exposure on Commercial Limes," *Jour. Ind. Eng. Chem.*, vol. 9, p. 287 (1917).

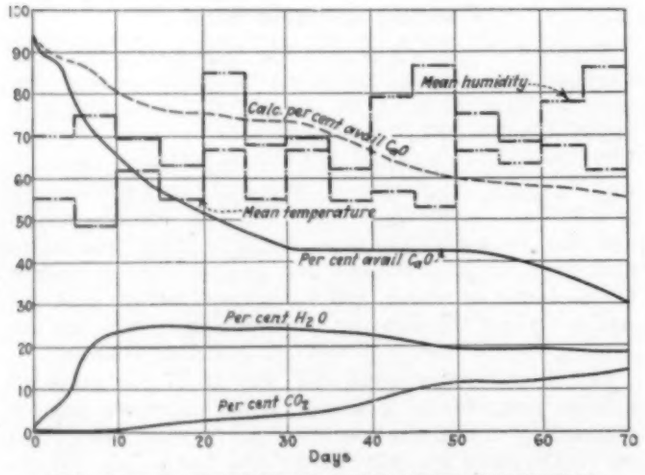

FIG. 1—AIR SLAKING OF LUMP LIME (SAMPLE 5)

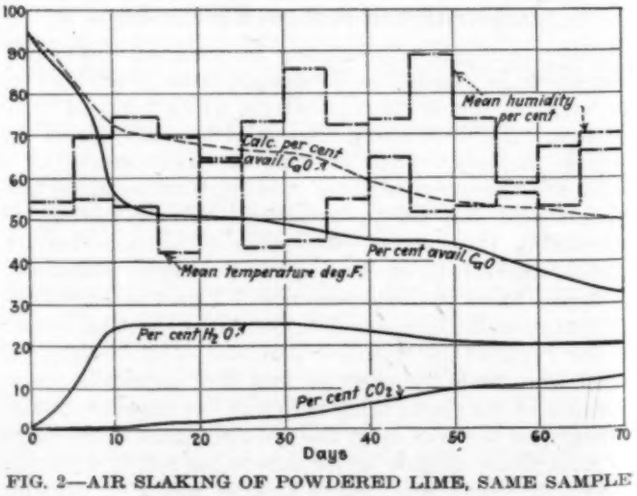

FIG. 2—AIR SLAKING OF POWDERED LIME, SAME SAMPLE

TABLE II—WATER CONTENT

Days Exposure	Lump Lime Obs.	Lump Lime Calc.	Lump Lime Diff.	Powdered Lime Obs.	Powdered Lime Calc.	Powdered Lime Diff.
0	1.37	....	...	1.37	....	...
1	2.26	....	...	3.68	....	...
2	3.61	....	...	4.79	....	...
3	5.35	....	...	6.08	....	...
6	13.92	....	...	18.11	....	...
10	24.34	23.7	0.6	23.44	....	...
15	24.89	23.3	1.6	25.61	23.2	2.4
20	24.92	23.1	1.8	24.90	22.8	2.1
25	24.78	22.7	2.1	24.54	22.3	2.2
30	24.98	22.8	2.2	24.40	22.1	2.3
40	23.03	20.9	2.1	22.95	20.1	2.8
50	20.73	19.3	1.4	19.47	17.6	1.9
60	20.33	18.4	1.9	19.80	17.4	2.4
70	19.93	17.6	2.3	18.50	16.2	2.3

TABLE III—CONTENTS OF AVAILABLE CALCIUM OXIDE

Days Exposure	Lump Lime Obs.	Lump Lime Calc.	Lump Lime Diff.	Powdered Lime Obs.	Powdered Lime Calc.	Powdered Lime Diff.
0	94.06	....	...	94.6	....	...
1	91.6	92.8	1.2	89.9	91.5	0.6
2	89.5	91.5	2.0	88.7	90.1	1.4
3	89.4	89.6	0.2	87.0	88.6	1.6
6	80.2	81.1	0.9	74.1	76.7	2.6
10	56.7	70.1	13.4	66.0	70.3	4.3
15	51.5	69.4	17.9	57.2	66.7	9.5
20	52.9	66.7	13.8	54.4	65.7	11.3
25	44.8	66.7	21.9	47.7	64.0	16.3
30	48.7	66.7	18.0	43.3	63.4	20.1
40	45.1	59.6	14.5	43.2	56.4	13.2
50	44.3	54.9	10.4	43.0	50.0	7.0
60	37.6	52.0	14.4	38.9	48.5	9.6
70	32.0	49.9	17.9	30.5	45.4	14.9

TABLE IV—SLAKING OF HIGH-CALCIUM LIMES

Days Exp.	% Avail. CaO	% H_2O	% CO_2	% Avail. CaO	% H_2O	% CO_2
0	94.28	1.01	0.22	95.11	1.20	0.14
1	93.5	1.11	0.21	94.3	1.53	0.20
3	90.2	1.71	0.25	92.0	3.22	0.18
5	87.5	2.3	0.20	90.0	4.01	0.55
10	81.0	4.0	0.23	84.7	8.8	0.73
15	75.5	6.1	0.33	79.8	14.2	0.82
20	71.0	8.4	0.42	74.7	20.5	1.01
30	62.7	13.6	0.37	60.4	26.0	1.05
40	56.5	18.8	1.21	62.3	25.6	1.50
50	52.7	24.4	2.10	48.6	23.3	2.80
60	50.7	25.0	3.45	47.5	20.9	3.76
70	49.0	24.5	4.48	47.5	18.2	6.00
80	48.2	22.9	5.70	46.0	16.1	9.80
90	45.8	20.0	8.11	43.1	15.0	12.6
100	42.4	18.7	12.00	39.0	14.3	15.4
110	38.8	18.5	12.75	33.7	13.3	18.5
120	36.0	18.3	14.20	27.1	12.5	21.1

tially all of the calcium oxide was converted into calcium hydroxide, and then decreased slowly as the hydroxide was changed to the carbonate. In both cases the maximum amount of moisture actually taken up by the sample was greater than the calculated amount required to combine with the calcium oxide; and after the conversion to the hydroxide was complete there was present always an approximately constant excess of moisture above that required theoretically to combine with the uncarbonated oxide. Table II shows the changes which took place in the moisture content during the period of exposure.

Apparently the presence of this "excess moisture" is due to the adsorption of water vapor on the surface of the very fine particles of hydrated and carbonated lime.

Absorption of Carbon Dioxide

The rate of absorption of the carbon dioxide was relatively much slower than the rate of absorption of moisture. This would be expected from the fact that the concentration of carbon dioxide in the air is relatively much lower than the concentration of water vapor. It is interesting to note that in each case the rate of absorption of carbon dioxide was greater between the thirtieth and fiftieth day than at any other time. That this was not due to any accidental variation in the concentration of carbon dioxide in the air above the samples is shown by the fact that the increase appeared at the same period in both cases, although the two experiments were not started at the same time, and by the fact that in other samples exposed subsequently similar periods of increased rates of absorption of carbon dioxide were observed at about the same stage in the slaking. Apparently at the end of about the first 30 days the hydrated lime undergoes a slight change in physical structure which results in making the mass more porous and thus facilitating the diffusion of air through the lime; while at the end of about the first 50 days the formation of carbonate films on the hydroxide particles again begins to decrease the rate of carbonation.

The percentage of available calcium oxide in the samples decreases very rapidly at first, during the rapid absorption of water, and then more slowly as carbonation progresses. In every case the amount of active calcium oxide as determined by analysis was less than the theoretical amount as calculated from the percentage of active calcium oxide in the original lime and the amount of water and carbon dioxide which had been absorbed. This discrepancy is slight at first, but increases rapidly as hydration progresses and appears to reach a maximum value several days after the conversion to the hydroxide is complete. The writers are inclined to regard this difference between the observed and the calculated values of the percentages of active calcium oxide as being due to a change in the physical structure of the hydrated lime—probably a conversion of the amorphous and very reactive calcium hydroxide first formed by the hydration into a finely crystalline and less reactive modification.

The values for the contents of available calcium oxide are shown in Table III.

Following these preliminary experiments, portions of limes of various types were ground to pass a 50-mesh sieve and were then exposed to the air for 120 days. Samples taken at frequent intervals were analyzed as described above.

Limes 63 and 44 were relatively pure high-calcium lime. The former was relatively soft and quick-slaking, while the latter was a very hard, dense, slow-slaking lime from oölithic limestone. The changes which took place during the air-slaking of these high-calcium limes are given in Table IV, and are shown graphically by Fig. 3.

In general, the curves showing the change in water content, carbon dioxide content and percentage of available calcium oxide are similar to the corresponding curves obtained in the preliminary experiments.

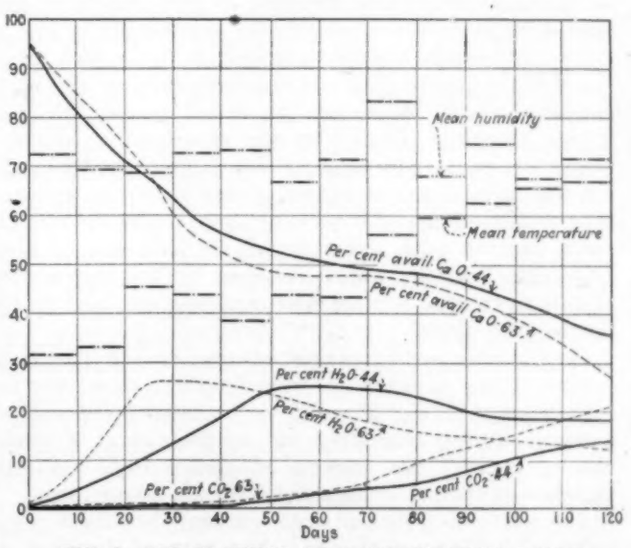

FIG. 3—AIR SLAKING OF HIGH-CALCIUM LIMES

TABLE V—SLAKING OF MAGNESIUM LIMES

Days Exp.	Lime No. 65 % Avail. CaO	Lime No. 65 % H_2O	Lime No. 65 % CO_2	Lime No. 111 % Avail. CaO	Lime No. 111 % H_2O	Lime No. 111 % CO_2
0	45.17	0.64	0.22	20.19	0.42	0.00
1	44.0	1.20	0.51	30.0	1.10	0.00
3	42.2	2.73	1.71	28.5	2.21	0.3
5	40.9	3.61	2.02	28.0	3.06	0.42
10	38.1	6.33	2.81	26.2	4.08	1.01
15	35.0	8.92	3.72	24.4	5.42	1.41
20	32.5	11.1	4.50	23.3	6.50	1.71
30	28.9	14.7	5.89	21.0	8.21	2.20
40	26.8	16.8	7.04	19.2	9.50	2.67
50	25.0	18.0	7.72	18.6	11.1	3.06
60	24.2	18.4	8.23	18.4	11.3	3.72
70	23.5	18.6	8.34	18.2	11.7	4.01
80	22.9	18.6	8.51	18.0	11.5	4.37
90	22.2	18.7	8.74	18.0	12.0	4.74
100	21.7	18.8	8.84	17.7	12.3	6.04
110	21.1	19.0	8.86	18.1	12.0	6.22
120	20.6	18.7	9.11	17.5	13.2	5.51

There was a distinct difference between the rates of slaking of the two limes. Sample 63 slaked rapidly, the hydration being complete at the end of about the fifteenth day and carbonation being about 42 per cent complete at the end of the one hundred and twentieth day. Sample 44—the dense, hard lime from oölitic stone—slaked much more slowly, hydration being complete only after about 50 days' exposure and carbonation being only about 29 per cent complete at the end of the one hundred and twentieth day.

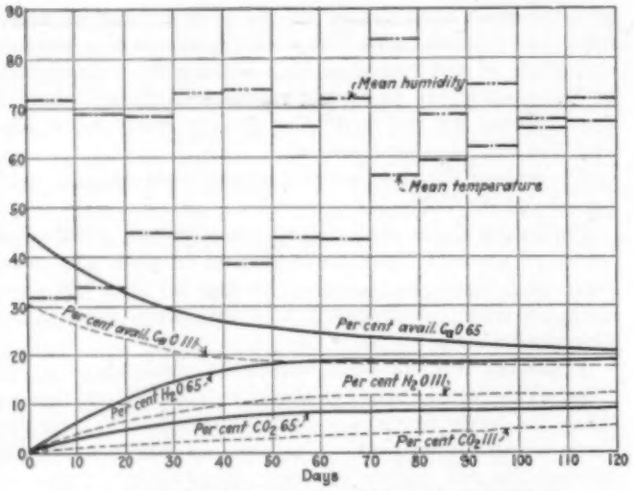

FIG. 4—AIR SLAKING OF MAGNESIUM LIMES

The changes which took place during the slaking of the magnesium limes—samples 65 and 111—are presented in Table V and are shown graphically in Fig. 4.

The hydration of the magnesium limes took place much more slowly than did the hydration of the high-calcium limes. Moreover, the water content did not, within the time covered by the experiments, attain a maximum value. In each of the magnesium limes the amount of moisture increased rather slowly at first and then remained almost constant. Apparently the calcium oxide reacted with the atmospheric moisture to form hydroxide, and the water liberated by the carbonation of this hydroxide reacted with and was retained by the magnesium oxide.

During the earlier stages of the slaking the magnesium limes carbonated more rapidly than did the high-calcium limes. The rate of carbonation decreased, however, during the latter part of the period of observation, so that the amount of carbonation was ultimately less than that obtained with the purer limes.

The available calcium oxide content decreased regularly as slaking progressed. The rate of decrease of active calcium oxide was much slower than that observed with the high-calcium limes. The writers assume that the slower decrease in available calcium oxide was caused by the fact that the magnesia inhibits the conversion of the very reactive amorphous calcium hydroxide into the less reactive crystalline modification.

The observed differences between the rates of slaking of the two magnesium limes correspond to an observed difference in the physical properties of the limes. Sample 65 was rather soft and light, and apparently had been burned at a relatively low temperature. Lime 111 was dense and hard and appeared to be slightly overburned.

The results obtained in the slaking of two typical siliceous limes are shown by Table VI and Fig. 5.

It will be observed that these two samples behaved very differently. Lime 53 acted very much like a typical high-calcium lime. The water content increased rapidly to a maximum value of 20.8 per cent and then again decreased. The percentage of carbon dioxide increased very slowly during the first 100 days, and then began to increase rather rapidly. The percentage of calcium oxide decreased rapidly at first, and then more slowly; and the decrease in the content of active calcium oxide was much greater than would be expected from the amount of carbon dioxide and water which were absorbed.

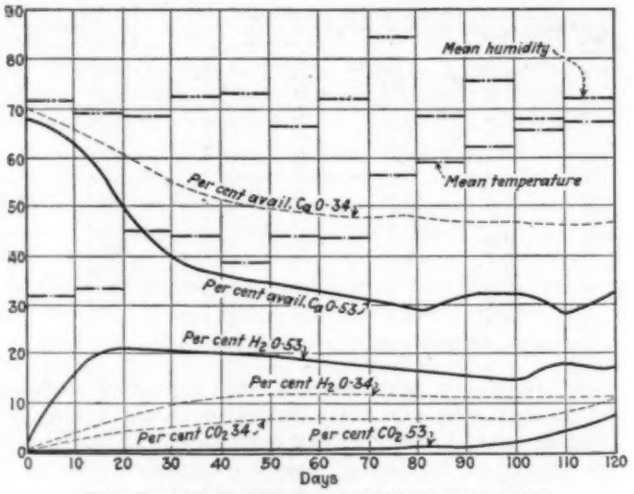

FIG. 5—AIR SLAKING OF SILICEOUS LIMES

On the other hand, Lime 34 behaved much like the magnesium limes. The water content increased rather slowly to about 12 per cent and then remained almost constant throughout the remainder of the period of observation. The percentage of carbon dioxide in-

TABLE VI—SLAKING OF SILICEOUS LIMES

Days Exp.	Lime No. 34 % Avail. CaO	Lime No. 34 % H_2O	Lime No. 34 % CO_2	Lime No. 53 % Avail. CaO	Lime No. 53 % H_2O	Lime No. 53 % CO_2
0	70.10	0.42	1.12	68.21	1.20	0.14
1	69.5	1.20	1.21	67.7	3.81	0.13
3	69.0	2.01	1.37	67.1	7.44	0.21
5	68.3	2.52	1.94	66.2	10.01	0.17
10	66.1	2.62	2.75	63.0	16.2	0.20
15	63.7	5.71	3.41	57.1	20.0	0.36
20	60.8	7.18	4.26	50.5	20.8	0.45
30	55.4	9.97	5.43	40.0	20.4	0.42
40	51.6	11.20	6.12	36.2	20.0	0.61
50	49.6	11.6	6.64	34.5	19.3	0.91
60	48.2	12.1	6.59	32.7	18.4	1.12
70	47.5	11.8	6.62	30.8	17.7	1.42
80	47.6	11.4	7.00	28.9	16.4	1.57
90	46.9	11.5	7.00	32.0	15.5	1.64
100	46.5	11.2	6.98	32.3	14.7	2.31
110	46.0	11.3	8.21	28.0	17.6	4.46
120	46.4	11.2	10.16	32.6	16.7	7.28

creased slowly at first, remained almost constant for about 50 days, and then began to increase again. The percentage of available calcium oxide decreased rapidly during the first 50 days, and more slowly thereafter, but the decrease was much less than the decrease observed with lime 53.

A comparison of the analyses of the two original limes shows no evident reason for this difference in slaking. Lime 34 contained considerably more magnesia than did lime 53, but the amount of magnesia was hardly sufficient to explain the anomalous behavior.

Summary

In the slaking of lime in air, the essential reactions are (1) the absorption of moisture with the formation of calcium hydroxide, and (2) the absorption of carbon dioxide with the formation of calcium carbonate.

With relatively pure high-calcium limes, hydration takes place much more rapidly than does carbonation. The amount of water actually taken up by the lime is greater than that theoretically required to convert the oxide into hydroxide. This excess water is probably moisture adsorbed on the surface of the particles of hydroxide and carbonate. The percentage of "active calcium oxide" in the material decreases very rapidly as hydration and carbonation proceed, the decrease in active calcium oxide being much greater than would be expected from the amount of water and carbon dioxide absorbed during slaking. This abnormal rate of decrease of "active calcium oxide" is probably due to the crystallization of the very reactive amorphous hydrate and the formation of relatively inert crystalline hydrate. It should be noted, however, that the slaking is accompanied by an increase in weight, so that the decrease in the *weight* of available calcium in the partially slaked lime from a given original portion of quicklime is considerably less than the decrease in the *percentage* of available calcium oxide.

With magnesium limes there is a more regular and more gradual increase in the percentages of water and carbon dioxide, and a more uniform and less rapid decrease in "active calcium oxide." Some siliceous limes behave very much like pure high-calcium limes; others act very much like magnesium lines.

The data obtained for the rate of hydration and carbonation in these experiments cannot be applied directly to the slaking of lime under all conditions, for in any case the rate of slaking will depend on the size of the heap, the method of piling, the amount of moisture in the air, and other external and independent factors. These results do serve, however, to throw some light on the general progress of the slaking reactions with different types of limes.

Gases in Metals

Tests conducted at the Bureau of Standards on the completeness of recovery of oxygen from oxides of iron and silicon in the vacuum fusion method for gases and metals have indicated complete reduction and recovery in both cases. Other oxides which may be present in steels are now being tested. Through the co-operation of a manufacturer of malleable cast iron, some tests have recently been made which indicate that results for oxygen by the Ledebur method on white cast iron are of little value because of the surface oxidation of the sample during its reduction to a finely divided form.

Annual Meeting of Manufacturing Chemists Assn.

Report of Executive Committee Presents Significant Sidelights on Important Problems Affecting the Industry

THE EXPANDING ACTIVITY of the Manufacturing Chemists Association for the year ended May 31, 1923, follows the curve of increasing industrial production very closely. With gathering momentum in business activity many calls arose for change and readjustment of standard practices, and increased use of the association facilities was made by member companies.

The policy of the association in regard to the tariff has always been to prepare in advance for a change and to aid the committees of the government to the limit in giving information with regard to the chemical industry. The association commends President Harding's attitude with regard to changes in accordance with the flexible provisions of the tariff. The President has announced his unwillingness to make any changes unless the facts show conclusively that they are absolutely necessary. Higher rates than are essential to protect against lower labor and production costs abroad are not advocated by the association.

Favor Working Clause in Patent Law

At the invitation of Senator Stanley, who introduced the patent bill, Henry Howard, as chairman of the executive committee, prepared a form incorporating a working requirement. This form embraced the modifications required to meet the objections raised by the American Patent Attorneys' Association and certain industrialists. Senator Stanley adopted this draft, and this was among the many measures pending when Congress adjourned on March 4 last. Lack of success in the last Congress to obtain this legislation does not mean that the effort has been abandoned. The introduction of the same or of a similar bill in the next session is expected.

Industrial Waste Legislation Coming

Although the original bills introduced into Congress with regard to industrial waste were aimed at prevention of pollution of the waters of the Atlantic seaboard, later these were enlarged to cover the country generally. Fearing that a blanket law applied without careful investigation would work undue hardships upon chemical manufacturers, the association opposed its passage.

Many other important matters have received attention from the executive committee. It has supported the bill to define and prohibit commercial bribery. It has opposed drastic prohibition enforcement bills which would have crippled chemical industries. It has supported the chemical division of the Bureau of Foreign and Domestic Commerce.

In addition a number of special committees have carried out important investigations. The work of the carboy committee has already been referred to in *Chem. & Met.* Other committees have worked on the multiple unit tank cars, the standardization of laboratory apparatus, the best practice in handling and unloading acid tank cars, the formulation of standards for steel drums and the shipment of acid less than 65 deg. Bé. in steel drums.

Unemployment and the Sales Machine

How the Spring Meeting of the Taylor Society at Syracuse Considered This Subject in Its Various Aspects

EDITORIAL STAFF REPORT

TAKING as a subject the report of Secretary Hoover's committee on business cycles and unemployment, this meeting of the Taylor Society was held on June 7, 8 and 9, for the purpose of studying the effect of unemployment on industry and to bring out the factors that would tend to stabilize employment. With this information in hand, a study was made of other departments of industry, such as the sales department and the planning division, noting what these could do in eliminating the causes that have resulted in unemployment in the past.

Dr. Willford I. King, of the Bureau of Economic Research, New York City, was instrumental in furthering the work of this Hoover committee. It was Dr. King's bureau which provided the statistical background upon which its findings were based. Dr. King spoke on the general subject of "Safeguarding Industry by Stabilizing Employment." In this talk the factors leading to unemployment were pointed out, by means of a study of the business cycles and various industrial statistics.

One of the first facts noted in this statistical research was that the lay-off of labor at the last depression occurred primarily in construction, factory and mines. There was no commensurate falling off of employment in retail business. The next factor studied was the interrelation between farm labor and industrial labor, and it was found that there was no appreciable shift, back and forth, between the farm and the factory. Another factor brought out was that the lay-offs occurred chiefly in large plants, and that the plants employing up to 100 workers showed no appreciable diminution in employment.

WHAT CAUSES THE BUSINESS CYCLE

This leads one to the possibility of there being some connection between large units in industry and the business cycle. From a careful study of the factors, Dr. King pointed out that this is probably not the case, but that the business cycle is caused by the action of retail business. Because the small manufacturer more generally meets his final customer direct and does not trade through the large retailers, his business is not affected, while the business of the large manufacturer, who deals through retail stores largely, is immediately affected by the behavior of the retailer.

The real cause then of the business cycle, as determined by this study, is the failure of the retailer to sell the consumer a sufficient amount of merchandise. The first result of this is lower orders from the retailer to the manufacturer. These lower orders to the manufacturer immediately result in unemployment in the manufacturer's plant, while the retailer's store, having its shelves full, must keep its employees in an endeavor to empty the shelves. By the time the business has caught up with itself again, the demand is good and the retailer needs all his employees for business purposes, while the manufacturer again builds up his employment.

Dr. King suggested several ways in which this trouble could be eliminated. His remedies were to scrutinize carefully all orders received, keep a fair reserve of cash, in boom times be very slow to raise wages and increase the working force, at all times keep a trained force in the plant, and finally keep a careful watch on the stock of unworked materials that they do not represent too much frozen capital.

From this paper of Dr. King and his remarks on the subject of the failure to sell goods to the consumer, we are led directly to the paper read by Prof. H. R. Wellman, of Dartmouth University, on the subject of the sales machine. Dr. Wellman opened his paper with several precautions to manufacturers, pointing out the possibility of sales saturation existing at any given moment, although it could not exist in the long run; and suggesting the possibility that business might be urged beyond the point of profit. He further pointed out that, at the present time, the average cost of marketing commodities is 68 per cent of the cost of production. These figures seem to him to be out of all reason, and the time is ripe for a reduction of these costs.

SOME REMEDIES SUGGESTED

Coming down to the main remedy for the failure of the sales departments and retail organizations to sell the goods produced by manufacturers, Dr. Wellman pointed out the absolute necessity of a well-thought-out and rationally based sales plan. In Dr. Wellman's words, "the sales plan must be based on the facts and not on theory; on the present and not on the past."

In forming a sales plan the essential elements are simple, although in following them out one may be led into a quite detailed study. These elements are: (*a*) study what has been done by means of the company's records; (*b*) study what can be done from market analysis; (*c*) determine what, from the two elements (*a*) and (*b*), shall be done. It is in this last that the essential factor of executive ability enters, in that judgment must be used.

Having made the analysis suggested above and determined the line of operation for the sales department, it is then possible to establish definite sales quotas, to determine the proper compensation for sales effort and to budget the total business along with the production department budget.

It is from the necessity of making this budget in order to control sales and thus stabilize the business that one is led directly to a study of the planning department of a business. In this connection, Keppele Hall, of the Joseph & Feiss Co., of Cleveland, gave before the society a description of what an ideal planning department was. It was pointed out by Colonel Hall that the planning department was, in reality, a service department for the whole business. It is its duty to study all phases of a business—finance, production, purchasing and sales. From the results of this study the mangement must be provided with proper figures and information upon which can be based the scientific, systematic and rational conduct of industry.

Having been led from a study of the question of unemployment to the heart of scientifically managed business —the planning department—the rest of the time of the convention was taken up by the study of some good examples.

An extremely interesting trip was taken to the plant

of the Corona Typewriter Co. at Groton, N. Y. This plant has been well known for many years for the perfection of its management system. The feature of its system lies in the fact that a careful study is made of the sales possibilities, and the manufacturing necessity is determined from this study. The planning department then organizes for a long period ahead, on the basis of this study, and employment conditions are in this way maintained at a stable point.

Following this inspection a visit was made to the plant of the H. H. Franklin Manufacturing Co., maker of the well-known Franklin automobile. This plant was one of the first to establish the Taylor system. By means of careful and efficient planning, it has information on hand many months in advance of the number of cars which it desires to make to meet its sales demands. In this way the company is able to order its stock at least 6 months in advance, and to work on this stock far in advance. The result is the flattening out of variations in the employment curve and a general stabilization of the industry, which results in efficient management and good employment conditions.

British Chemical Industries

Nitrogen Fixation Again to the Fore—Developments in Blast-Furnace Construction and Alcohol Production

FROM OUR LONDON CORRESPONDENT

LONDON, May 19, 1923.

THERE is nothing of importance to report in regard to chemical markets during the past month, the position having remained stable and prices firm with low stocks. The continental situation is still a dominating factor, and its effect has been substantially that anticipated by the trade. It is felt that even if a solution to the present impasse should be found, there can be no revival of serious competition from Germany for a considerable time to come. The political situation is a little obscure, several sections of the press are predicting the resignation of Bonar Law, and people are gloomy or optimistic according to their own fancy in regard to his possible successor as Prime Minister.

INTEREST REVIVED IN NITROGEN FIXATION

During the war about twenty secret patents were filed by the government, based on investigations carried out at the research laboratory established during the war under the auspices of the Nitrogen Products Committee, and in many cases corresponding patents were taken out in foreign countries and British possessions covering ammonia synthesis, manufacture and purification of industrial gases, oxidation of ammonia and the manufacture of nitrates. Subject to the right of Brunner Mond & Co. to non-exclusive licenses, the Disposal Board has invited offers for these patents, but as tenders must be received not later than May 25, it seems doubtful if any serious or definite proposals can materialize from interests other than British. One of the most interesting of these patents was that of an explosion compressor evolved by H. A. Humphrey somewhat on the lines of his well-known pump. Humphrey had in mind the combination of the Häusser explosion process with an air compressor operating as one unit with a free piston, and it was calculated that for an output of 2 tons of nitric acid per day about 3,000 kw. could be generated continuously, part of which would, of course, be required for working the process. The wisdom of combining a power unit with the nitric acid explosion unit is open to the great objection that when acting efficiently as a compressor, the nitric acid yield is probably low and, conversely, an apparatus designed primarily for nitrogen fixation is likely to prove an inferior compressor. Additional interest in the Häusser process for combining oxygen and nitrogen when coke-oven gas is exploded has been aroused by two recent papers of Prof. W. A. Bone, read before the Royal Society and the Royal Institution. Professor Bone claims that the elimination of hydrogen as a component of the flammable mixture so as to leave substantially carbon monoxide as the sole combustible constituent gives rise to conditions under which the nitrogen assumes abnormal activity with increased yields of nitric oxides. As a matter of fact, a process covering the removal of hydrogen from coke-oven gas for this purpose is already being developed, so the way to practical results is, to some extent, prepared. It is open to question whether Professor Bone is right in using the word "activation" in describing this phenomenon, which is apparently feasible only when there is less than about 2 per cent of hydrogen present, but to the industrial world the chief interest lies in a complete thermodynamic solution and practical results.

PROGRESS IN BLAST-FURNACE FUEL ECONOMY

Sutcliffe & Evans have again done something revolutionary on the basis of their previous researches and if their claims are substantiated, the quantity of fuel per ton of pig iron may be reduced to something like 12 cwt. The investigations have shown that the chief factor in the blast-furnace process is the "combustibility," or, let us say, the chemical reactivity with oxygen of the coke used, which depends largely on its physical condition and especially on its porosity. The desirable properties of a good blast-furnace coke are well known, and Sutcliffe & Evans claim to have produced a smokeless fuel made by carbonizing briquets composed of 80 per cent coal and 20 per cent coke breeze, which is harder than metallurgical coke, is in fine granular condition and has a porosity practically equal to charcoal. It is understood that the process is to be tested on a commercial scale soon.

PROCESS FOR UTILIZATION OF WASTE CELLULOSE

Messrs. Lynn and Langwell have given an account of their process for transforming cellulose directly into alcohol, fatty acids, etc., by means of bacteria and without the use of considerable quantities of relatively expensive chemicals. The basic British patents are Nos. 134,265 and 161,294 and the basic discovery is that of a bacillus which rapidly attacks almost every form of cellulose under either anaërobic or aërobic conditions. This organism thrives and does its work at the extraordinary temperature of 68 deg. C., at which any ordinary form of vegetable fiber (excepting wood or cork) is decomposed, forming carbon dioxide and, in addition, alcohol, acetic acid, butyric acid, methane and hydrogen or varying mixtures of these according to the conditions. The process is being worked on a large scale at the works of Power Spirit, Ltd., Epsom, and in view of the large amount of inedible waste vegetable fiber annually produced, it seems possible that this process may be of considerable economical and technical importance.

Production of Hydrogen by the Thermal Decomposition of Oil

The Concluding Article of a Series Describing Government Experiments in Producing Pure Gas for Air Service Requirements—Arrangement and Operation of Plant for Thermal Efficiency—Cost Considerations

By E. R. Weaver
Chemist, Bureau of Standards

THERE are two reasons for the excessive heat losses in blast gas and by radiation: (1) The great difficulty, in a two-shell plant, of burning the finely divided carbon deposited in the vaporizer to CO, or of utilizing any considerable portion of the heat produced from it; and (2) the long blasting period required to get the plant up to a sufficiently high temperature at the beginning of the run. Most of the difficulty occurs in the last 100 or 200 degrees; if the blasting period can be shortened, by the use of preheated air or otherwise, considerable economy must result.

Burning Carbon Deposit

The carbon deposited in the vaporizer is so finely divided that it is particularly difficult to get anything but carbon monoxide while burning off the checker brick. If air is introduced only at the bottom of the checkerwork, all the carbon will be burned off at the bottom and the bricks subjected to the cooling action of the air stream before the top of the column is cleared. At the same time the upper part of the tower is subjected only to the temperature of carbon monoxide production, and a large part of the fuel escapes as unburned carbon monoxide. If any considerable benefit is to be derived from the deposited carbon, it will be necessary so to arrange the air inlets that the carbon is burned off in all parts of the tower at about the same time. Practically it is impossible to do more than introduce air at four or five levels in approximately the right proportion. After the carbon is removed from the checker brick the blast gas from the generator can be burned completely in the tower and its fuel value utilized to the utmost; while carbon is present, blast gas from the generator is entirely wasted. For this reason, and because it is desirable to blast the generator strongly just before a run in order to have a maximum temperature in the coke bed, much better results are obtained by burning the carbon from the brick before starting to blast the generator than by blasting the two simultaneously.

It was found in practice that more time is required to burn the carbon from the checker brick than to make a run. It should therefore be possible to save much time and a considerable amount of radiation from the generator by employing two vaporizers with one generator, the carbon being burned from one while a run is being made with the other.

The use of regenerators for preheating the air used in the generator should also effect a considerable economy. Just how much fuel can be saved by means of these improvements is uncertain. It may be quite possible to reduce the consumption of coke in the generator to the small amount of compact solid unavoidably burned while burning out the deposited carbon to prevent the clogging of the gas passages.

Figs. 18 and 18A show semi-diagrammatically the arrangement believed to be most economical for a plant of large capacity. Each vaporizer is here divided between two shells called the vaporizer and superheater. This permits the oil to be introduced at the top and coolest part of the checkerwork; it places the hottest part of the checkerwork and linings under minimum load; and on account of the shorter connections, the two shells should cost but little more to construct than a single shell of equivalent capacity connected to permit the blast to enter the bottom.

Refractories Required

Probably the most difficult problem encountered in connection with the process is that of obtaining suitable refractories for linings and checkerwork. Following the plant experiments, load tests were made at high temperature in the ceramic laboratories of the Bureau of Standards for the purpose of ascertaining the most suitable materials for the purpose. Including the half dozen materials which had already been eliminated by use in the plant, every refractory known to be commercially available and which it was believed might meet the requirements of the plant was tested. Of these materials, two were found to have properties

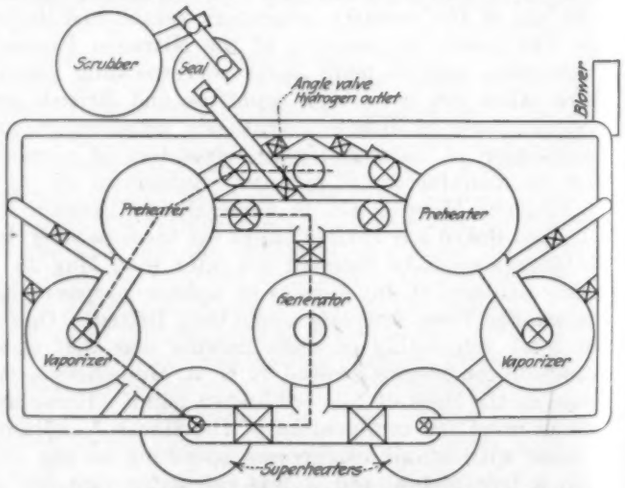

FIG. 18—PLAN OF PLANT ARRANGED FOR HIGH THERMAL ECONOMY

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which should make them of the greatest value. They were self-bonded silicon carbide and a kaolin product made by a recently developed process, the details of which have not been made public. Both refractories were tested under a load equal to the weight of a 15-ft. column of the same material.

The kaolin brick showed only a small contraction under the load at a temperature as high as 1,600 deg. C. and did not fail decisively until 1,675 deg. C. was reached. The silicon carbide brick showed no signs of injury at a temperature of 1,725 deg. C., which was the highest obtainable in the furnace used.

A comparison with some of the refractories used in the plant indicated that had kaolin brick been used there would have been but little if any injury at the temperature obtained during the experimental runs, and that a temperature at least 200 deg. C. in excess of those employed would not have seriously affected silicon carbide linings and checkerwork. The silicon carbide was also free from reducible iron compounds. The kaolin was not, but it is believed that a similar material practically free from iron can be obtained at a price considerably below that of silicon carbide. No serious difficulty should be encountered with refractories in a plant having an inner lining and checkerwork of silicon carbide. For purposes of economy the kaolin refractories should be used in the cooler parts of the plant. If a preheater for air is employed, there is no necessity for using in it any refractory of a quality superior to that of the average firebrick.

If a single vaporizer is used with the generator and preheating the air is not resorted to, there is no need for any valve subjected to high temperature except the stack valve. If, however, two vaporizers and preheaters are used with a single generator, a number of hot valves are required. Experience with the experimental plant indicated that a great deal of difficulty would be encountered in keeping a steel or iron valve in condition under such severe service even if water-cooled, and that the heat lost in such a valve during the producing period is far from a negligible factor in determining the capacity of the plant.

It has been found that machined surfaces of the nickel-chromium alloy Nichrome will remain in good condition at a temperature at least 500 deg. C. hotter than will machined steel surfaces. The valve heads and seats should therefore be made of this alloy. For economical reasons, however, the Nichrome parts should be as small as possible. The valves between vaporizer and generator and vaporizer and preheater may reach a temperature higher than the softening point of Nichrome, hence the castings made of it should be in contact with water-cooled steel supports in order that the exposed parts may be cooled below the danger point by conduction. The Nichrome parts of other hot valves in the plant will be in no danger of injury from the heat, but the valve stems must be water-cooled to prevent carbonization of the packing. The valves between the vaporizers and the generator should be of the double-gate type with a vent between the gates in order to indicate at once any failure of the gates to seat tightly and to prevent contamination of the hydrogen in case such a failure occurs. The valve mechanism indicated in the drawings of the proposed plant is merely suggestive. Several of the ordinary types of valve mechanism could be employed successfully in hot valves of the character described. Fig. 19 shows details of some of the valves and refractories proposed.

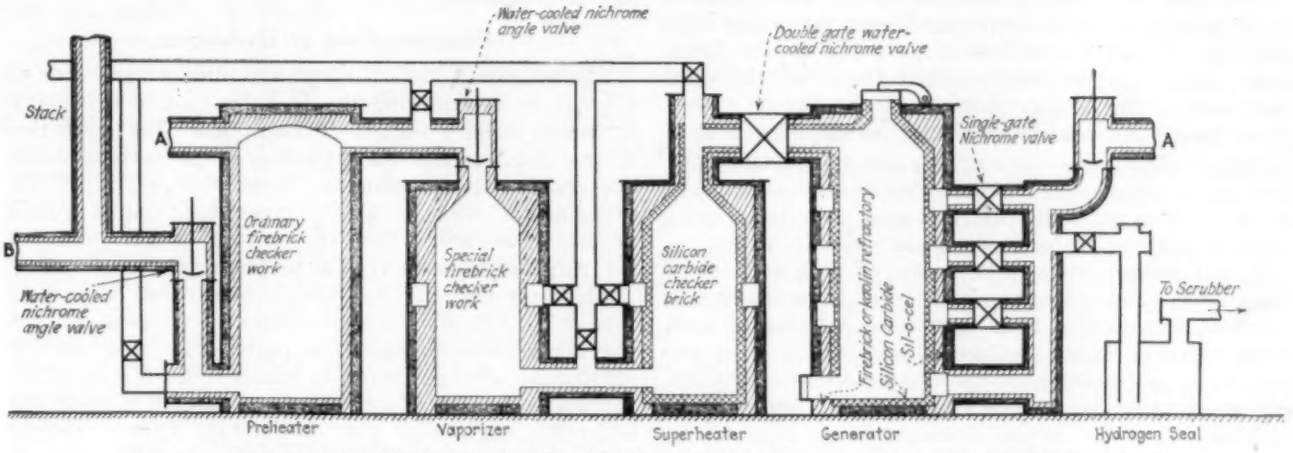

FIG. 18A—DIAGRAMMATIC SECTIONAL ELEVATION DEVELOPED ALONG LINE DOTTED ON PLAN

It is certainly desirable if not absolutely essential to use in the generator a solid fuel practically free from ash-forming constituents. The fuel may be either pure carbon or carbon containing a considerable quantity of heavy hydrocarbons, in which case some hydrogen will be recovered from the solid fuel.

Coke—If an ordinary coke is used, it is impossible to obtain a sufficiently high temperature without completely fusing the ash and producing a clinker very difficult to handle. This difficulty would be serious enough if air were blown in only at the bottom, but when secondary air is used in large quantity and clinker is produced throughout the fuel bed, the operation of the plant is almost impossible. The fused clinker also attacks the generator linings, which present a sufficiently serious problem without this complication. Even if the clinker could be handled in the ordinary way, at least two men would have to be employed to remove the clinker at frequent intervals, interrupting the operation of the plant and permitting it to cool off. The amount of solid fuel used is not large, and the amount of labor, interruption to service and deterioration of refractories involved in the use of an ordinary coke are out of all proportion to the saving in the cost of the fuel at the present time.

Retort Carbon—Retort carbon is an ideal fuel for use in the process, both because it is free from ash- and clinker-forming constituents and because its high density and heat capacity permit long runs.

The only serious objection to the use of retort carbon

is the limited supply available. It is an unimportant byproduct of a coking process which is being supplanted by other methods, and no increase in the demand for the material is likely greatly to increase the supply. The present production in this country is only about 1,000 tons annually and probably half that amount is used by the carbon companies in the manufacture of their varied products.

Petroleum Coke—Petroleum coke is commercially available in sufficient quantity and burns practically without residue; but as ordinarily produced, the material is so porous and has such low heat capacity that only comparatively short runs are possible. The porosity of the material is no doubt of advantage in presenting a larger surface to the oil vapors; it is probably a disadvantage in blasting, because it shortens the zone of carbon dioxide formation in which alone the temperature necessary for complete decomposition of the hydrocarbon can be attained.

The most satisfactory solution of the fuel problem would appear to be the manufacture of petroleum coke briquets of high density. Similar briquets have been made cheaply and in large quantity from the lampblack produced by the oil-gas process on the Pacific Coast. These have been used successfully in water-gas manufacture in which the requirements are substantially the same as in the present process. Petroleum coke appears to be a more suitable raw material than lampblack; coal-tar pitch is probably the most suitable binder.

If this process were to be employed on a sufficiently large scale, it would certainly be most advantageous to purchase the residue from petroleum refining at such a stage that it would produce oil and carbon in proper proportion and to complete the distillation at the hydrogen plant under conditions which would yield a dense residue. In this case the abundant waste heat of the hydrogen plant would be employed for the distillation and the hydrocarbon vapors conducted to the hydrogen generator without condensation. The cost of hydrogen produced on a large scale by this process should rival that of the cheapest methods for producing hydrogen from water-gas so extensively employed in Europe for the synthesis of ammonia. It is probable that a hydrogen plant operated as an integral part of an oil refinery, utilizing hydrocarbon gases and residues of every kind which could not be otherwise disposed of to greater advantage, supplying waste heat for the operation of the oil stills and consuming a part or all of the coke produced by the refinery, would yield hydrogen at lower net cost than any other known process.

The first cost of a plant combining distillation with hydrogen production, and the skilled operation it would require, make it unsuitable for intermittent operation and therefore out of the question for an aviation field. It is therefore beyond the scope of this investigation, and the possibilities of such future developments are merely suggested.

Probable Cost of Hydrogen

The following cost estimates are intended to serve as a guide in determining the probable cost of producing hydrogen under a variety of conditions. The quantities of fuel required and the capacities of the various plants are conservatively estimated from the results of the experiments with a 4.5-ft. generator and a single vaporizer, assuming that the amount of gas produced per run will be proportional to grate area.

The unit costs of materials, investment, labor and repairs vary so much under different circumstances that the reader should regard the figures given as merely illustrative of the manner in which these factors affect the cost of the product. The estimates are made for hydrogen containing not more than 1 per cent of methane; the exclusion of carbon monoxide depends

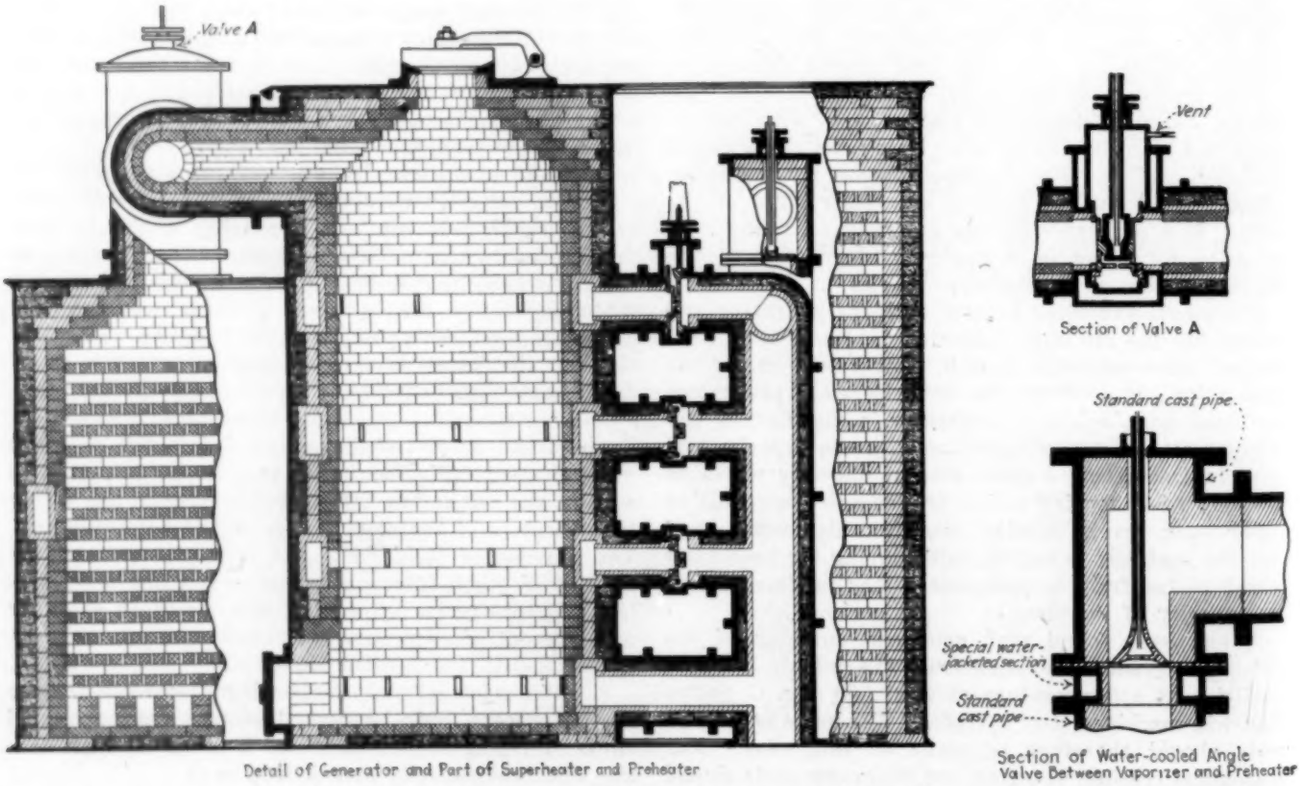

FIG. 19—DETAILS OF REFRACTORIES AND VALVES

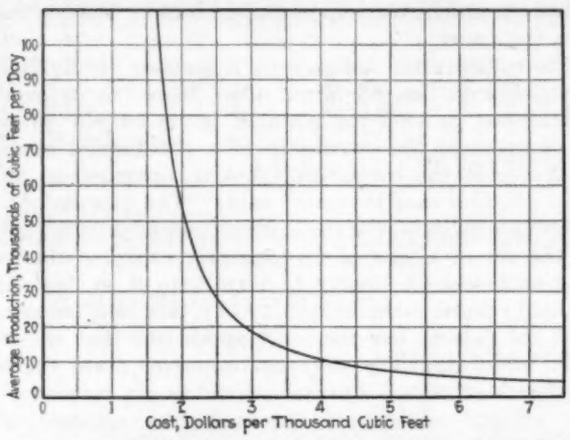

FIG. 20—APPROXIMATE RELATION BETWEEN DAILY PRODUCTION AND COST OF HYDROGEN

entirely upon the extent to which it is possible to eliminate iron oxide from the plant.

The experimental plant made about 13,000 cu.ft. per run under favorable working conditions with a coke consumption of not over 30 lb. per 1,000 cu.ft. Three runs are easily made per 10-hour day. Fuel oil actually cost 8.25c. per gallon delivered in Trenton, and retort carbon cost $15 per ton at point of origin, to which $8 freight and hauling charges had to be added. One man should be able to operate a well-equipped plant under normal conditions provided other workmen are at hand to assist him in case of emergency. The air blower consumes practically all the power used. Twenty horsepower is sufficient for this purpose for a 4.5-ft. generator and is assumed proportional to grate area for larger installations. The cost of repairs will depend principally upon the frequency of replacement and cost of refractories. Other repairs should not be expensive.

Cost estimates are tabulated in Table III for the conditions stated in the following several paragraphs. The column of the table headed by a certain letter contains the figures corresponding to the conditions stated in the paragraph marked with the same letter. The estimated cost of the plant does not include housing or hydrogen storage.

A. Plant—A 4.5-ft. generator with a single vaporizer. Estimated cost of plant, $35,000. Average production, 10,000 cu.ft. per run; one run per day on 300 days per year.

B. Plant—Same as in paragraph *A*. Average production, 10,000 cu.ft. per run. Three runs per day on 300 days per year.

C. Plant—A 6-ft. generator with a single vaporizer. Estimated cost of plant, $45,000. Average production, 25,000 cu.ft. per run; three runs per day on 300 days per year.

D. Plant—Same as in paragraph *C*. Average production, 25,000 cu.ft. per run; nine runs per 24-hour day on 360 days per year.

E. Plant—A 6-ft. generator with two vaporizers and two preheaters. Estimated cost, $70,000. Average production, 25,000 cu.ft. per run; five runs per day on 300 days per year.

F. Plant—Same as in paragraph *E* with an additional briquetting plant for making a dense fuel from petroleum coke. Estimated cost of plant, $85,000. Average production, 25,000 cu.ft. per run; fifteen runs per 24-hour day on 360 days per year.

G. Plant—Two 8-ft. generators, preheaters and superheaters equipped for distilling petroleum residues to supply both hydrocarbons and contact carbon. Estimated cost of plant, $150,000. Average production, 55,000 cu.ft. per run; thirty runs per 24-hour day on 360 days per year.

TABLE III—ESTIMATED COST OF HYDROGEN

	Plant *A*	Plant *B*	Plant *C*	Plant *D*	Plant *E*	Plant *F*	Plant *G*
Average daily production. Thousands of cu.ft.	8.2	25	62	225	100	375	1,650
Costs, Cents per 1,000 cu.ft.							
Fuel oil at 8 cents per gal.	43	43	43	43	43	43	....
Dense carbon fuel at $35 per ton.	88	61	61	52	52	....	....
Petroleum coke at $20 per ton.	....	....	....	....	....	25	....
Petroleum residues, 30 per cent free carbon at $8 per ton	....	....	....	....	....	....	17
Labor and superintendence	80	44	18	9	11	8	3
Electric power at 2 cents per kw.-hr.	20	13	13	10	12	10	8
Repairs and miscellaneous operating expenses	30	25	20	15	20	15	10
Eight per cent of investment for interest, taxes, etc.	94	31	16	9	15	4	2
Amortization (full value in 10 years)	117	39	20	6	19	5	3
Total	$4.62	$2.56	$1.91	$1.40	$1.72	$1.10	$0.43

The estimated costs given in Table III are plotted against the assumed daily production in Fig. 20.

The experimental work described in this paper was carried out by S. F. Pickering, P. G. Ledig, C. P. Larrabee, A. H. Graham and F. W. Trapp, under the direction of the author, who wishes to acknowledge the loyal co-operation of the whole group. It is a pleasure also to acknowledge the interest taken in the investigation and the assistance rendered by F. E. Crowell, engineer of the Gas Engineering Co.

Crystallization or Poor Heat-Treatment?

British engineering papers during the early part of May gave much attention to the report of an accident which occurred last December on the London & Northwestern R.R. While traveling at about 60 miles an hour, a locomotive driving axle broke short off, just inside the wheel hub. An investigator for the Ministry of Transport reported that the various tests on the broken part showed that it was made from a badly segregated heat of steel. He also said that the fractured surface had the appearance common to a failure due to "fatigue."

On the other hand, a report from the National Physical Laboratory, which was consulted on the case, said specifically that the test pieces were coarsely crystalline, and the break was a type of fracture typical of *overheated* steel.

In England as well as in America there is a lack of understanding between modern metallurgical investigators and the older school of mechanical engineers engaged by railroads and other large consumers. As a matter of fact, it seems increasingly clear that a vast majority of the breaks that are commonly called "crystallization breaks" or "fatigue fractures" are due to improper refinement of the grain by heat-treatment after the forging operations.

The failure in question is one extremely difficult to have been detected at any time subsequent to the steel-making process. Segregation and piping occurred toward the axis of the piece, and the outside material, which was sampled, showed correct chemical analysis and good physical properties.

It is to be emphasized, of course, that eternal vigilance is the price of safety. The total stress on the part which failed was not much more than 6,000 lb. per sq.in. over the whole area, which allows a factor of safety of nearly 12 for the particular steel used. This margin would certainly appear to be adequate for all purposes, and it is suggested by *The Engineer*, in its issue of May 4, 1923, that there was either an original flaw existing near the surface of the axle or that it was scratched during machining or at some other time before the wheel was pressed on. Such surface scratches are known to be very damaging.

Legal Notes

By Wellington Gustin
Of the Chicago Bar

Fixing Profits of Infringing Machine

Plaintiff Loses Claim for Damages Through Failure to Establish Proper Standard of Comparison

What is the proper measure of damages for infringement is involved in the suit of the DeLaski & Thropp Circular Woven Wire Co. against the Empire Rubber & Tire Co., involving the DeLaski & Tropp patent, No. 1,011,450, for a machine for wrapping automobile tires before vulcanization. In another case the U. S. Court of Appeals held the patent valid and the U. S. District Court in this case held the patent valid and infringed and awarded the plaintiff damages, but declined to award it profits and to treble the damages. Both parties appealed from this judgment, 287 Federal 1.

The question of profits turned on the question of what constitutes a proper standard by which to compare the gains and savings made by the use of the infringing machines over other means available at the time for doing the same work.

Another machine, known as the Williams machine, was also used by the defendant for the same purpose as the infringing device. These machines the court regarded as the proper standard of comparison. The plaintiff, however, insisted that original hand wrapping as done before the invention was the proper standard. But since the Williams machine and other machines, though not of the utility of the machine infringed, were not only available but used by the defendant, they became the proper standard of comparison.

As the plaintiff built its case upon hand wrapping as a proper standard of comparison, which was rejected by the court below, the Court of Appeals said there had not been any evidence given as to gains and savings in the use of the infringing device measured by the proper standard as adopted by the lower court, and therefore there was nothing in the record to support the plaintiff's claims for profits, therefore its claims must fail.

Sales Agreement Proves Unenforceable

No Valid Contract When One Party Reserves the Right to Cancel at His Pleasure

The Federal District Court has said that an agreement by defendant to purchase a stated quantity of a product per week so long as it was made by plaintiff and conformed to sample, and for plaintiff to deliver such quantity "every week thereafter," does not constitute a contract binding on the defendant, since the plaintiff might cease manufacture at will, without violation of the agreement. This is laid down in an action on a contract brought by Edward J. McCaffrey against B. B. & R. Knight, Inc., 282 Federal 334.

The seller did not agree to manufacture goods of the kind or quality for any particular period, and if he should cease to manufacture goods of that kind, or goods which conform to the sample, he would not be liable for a breach of any obligation which he had assumed or which was imposed upon him by the contract, says the court.

The seller rested his case on a decision in McMullan vs. Dickinson Co., 63 Minn. 405. Here the defendant had agreed to keep the plaintiff in its employ so long as he retained the ownership of a substantial number of shares in the corporation and it continued in business. In this case the court said: "The expressions of a contingency whereby the contract might be terminated by the act of either party expressly excluded the idea that each was at liberty to terminate it at any time without regard to the happening of either contingency."

In the case at bar the court points out that the contract is substantially different in terms from the one in the cited case. Further, there is no reference to any subject matter extraneous to the contract that excludes the idea that the seller was at liberty to cease his manufacture, regardless of the wishes of the buyer.

Hence the judgment that the contract was unenforceable.

Famous Trademark Case Reversed

Highest Court Rules Foreign Maker Cannot Compete With Assignee of His Mark

In the now famous trademark case of A. Bourjois & Co., Inc., vs. Katzel, the United States Supreme Court has reversed the decree of the Circuit Court of Appeals (43 Sup. Ct. 245).[1] The facts of this case are briefly set out as follows: In 1913 A. Bourjois & Cie., E. Wertheimer & Cie., Successeurs, doing business in France and also in the United States, sold to the plaintiff their business in this country, with their good will and their trademark registered in the Patent Office. The plaintiff since its purchase has registered them again and goes on with the business that it bought, using substantially the same form of box and label as its predecessor and importing its face powder from France.

The defendant bought a large quantity of the same powder in France and sold it here in the French boxes, which closely resemble those used by the plaintiff. The court said there was no question that the defendant infringed the rights of plaintiff unless the fact that defendant's boxes and powder are the genuine product of the French concern gives her a right to sell them in the present form.

In giving its reasons for holding that plaintiff's rights were infringed by the transactions of the defendant the court says that after the sale of their business good will and trademarks in the United States the French manufacturers could not come into the United States and use their old marks in competition with the plaintiff. That proposition is founded on the trademark act of Feb. 20, 1905, section 10, authorizing assignments. Further, it says that if for the purpose of evading the effect of the transfer it had arranged with the defendant that she should sell with the old label, it would be plain that the arrangement must fail, but there was no such conspiracy in this case. "The vendors," the court says, "could not convey their goods free from the restriction to which the vendors were subject. Ownership of the goods does not carry the right to sell them with a specific mark. It does not necessarily carry the right to sell them at all in a given place."

[1] See Wellington Gustin, "What's in a Name?" *Chem. & Met.*, vol. 27, p. 342, Aug. 23, 1922.

Hints
That Cut Cost.
Management Puzzles

The Plant Notebook

An Exchange for Operating Men

Practical
Problems of
Plant Operation

Removal of Carbon From Liquids

BY J. BENNETT HILL
The Barrett Co.

In the use of decolorizing carbons in the recovery of gasoline used in dry-cleaning it is often desirable to remove the carbon by settling alone and so avoid filtration. While the bulk of the carbon settles readily, there is a small amount of very fine material that settles only very slowly. This can be removed conveniently by making use of the dirty soap in the gasoline to carry it down. Where the gasoline is not distilled, this soap is normally removed by a treatment with a solution of caustic soda which precipitates it out. If the treatment with decolorizing carbon is given before this soap removal, the bulk of the carbon settled out, and the settled liquid treated with caustic soda, the fine carbon is carried down by the gelatinous soap precipitate, leaving a perfectly clear gasoline.

Possibly this same general idea might be of value in other industries.

Stirrer Efficiency

Who Said Paddle Stirrers Were Not Efficient?—Read This

The article by W. L. Badger and his two co-workers which appeared in the Dec. 13 issue of *Chem. & Met.* was exceedingly interesting to me. The subject "Stirrer Efficiency" has received very scanty study throughout the industry and the amount of misinformation on the subject is great. I recall one incident from personal experience which may be of interest.

Some time ago it was essential for purposes of experimentation to have a wooden tank stirred somewhat rapidly. There was in the plant a tank with an ordinary type of paddle stirrer. It was not even shaved off at an angle of 5 deg., as was the case with Professor Badger's tank. but consisted of a 4x4 tapered slightly to the end and bolted to an upright shaft. Two such arms pointing in opposite directions at the bottom, and two more arms at a 90 deg. angle from the other two, situated 18 in. above the lower arms, made up the whole stirrer. The tank happened to be filled at the time with a finely divided white precipitate suspended in water, and since there was considerable doubt as to the efficiency of the stirrer in question, it was decided to make some tests on the tank as it was. To do this the stirrer was started and when the tank was apparently in full equilibrium 12 gal. of strong solution of victoria blue was dumped in. Six samples of the charge were taken at various parts of the tank, three immediately after dumping in the dye and three at the end of 3 minutes' stirring. The dyestuff gave the liquid a distinct blue color and there was no difficulty whatever in distinguishing the samples which had been in contact with the dye from those which had not. The first samples showed very varying colors from white to very deep blue. The second set of samples were uniform both as to appearance of the unfiltered samples and examination of the filtered solutions. In other words, the tank was stirred completely within 2 minutes. Doubtless if we had started to stir at moment of adding the dye the time would have been longer. This seems to confirm Professor Badger's interesting conclusion that paddle stirrers are surprisingly efficient.

To the Operating Man, Be He Executive or Subforeman

This department will depend for its healthy growth upon your contributions. No man or group of men can supply the raw material adequately. It must represent the experience of all of the men in our industries. If you will contribute one short item from your operating or management experience, you will help to build an invaluable, interesting storehouse of material which will help you, your company and the industry. For every idea you give, you'll get a thousand.

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Chem. & Met.
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New York City.

The Great k_o Mystery

Errors in the Calculation of the Rate of Heat Transfer

Everyone who has had to do with the installation of evaporators or stills or cooling coils has undoubtedly used the following formula:

$$A = \frac{Q}{k_o h t_m}$$

By this it is possible to calculate the heating or cooling surface necessary for the particular piece of equipment in question. A, of course stands for the area or surface required, k_o is the coefficient of heat transfer, Q is the total heat lost or gained during the operation, h is the number of hours which is required for carrying out the operation, t_m is the mean temperature difference or the temperature gradient in degrees Fahrenheit.

The calculation or estimation of k_o is a somewhat inaccurate performance, as it depends on a number of rather indeterminate quantities. Conductivity is the reciprocal of resistance and the resistance to heat flow in the case of a liquid to liquid transfer through a pipe would be equal to the resistance of the water film on the metal pipe plus the resistance of the metal itself, plus the resistance of the liquid film on the outside of the pipe. Of course the total resistance varies with the rate of flow of cooling water, the thickness of the metal, surface films or deposits on the metal pipe and many other things. In other words, the value of k_o is not

Gypsum coated (on left) and clean copper tubing. Why k_o varies

a mathematical certainty, even though it is a so-called constant.

All this serves as an introduction to a specific example of a variation in k_o which has come to the writer's attention. Upon calculating k_o from the best data possible, a value of 230 was obtained, and from this was estimated a total area of heating surface which amounted to about 72.4 sq.ft. A recheck of these figures by another engineer taking into account some experience which he had had with the liquid in question gave an estimated value of 30 for k_o and a consequent value of 555 sq.ft. There followed a series of tests in the plant and in it conditions were developed from which a value for k_o was calculated. This value was found to be in the neighborhood of 60.

The photograph herewith presented illustrates as well as anything can the reason why any calculation of the rate of heat transfer is practically impossible unless some previous experience with the solution can be relied on, or unless the liquid remains clear and does not deposit on the pipes.

Restoring Steel Barrels

How the Welding Outfit Can Be Utilized to Keep the Scrap Pile Empty

The use of oxy-acetylene welding for reclaiming leaking and damaged steel barrels is recommended. Slightly defective containers that would otherwise soon become worthless scrap can be reclaimed so that they may be re-used or resold by a few minutes' skillful application of the welding torch.

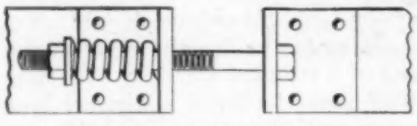
Used metal barrels that are not obviously beyond repair are first steamed and thoroughly cleaned inside and out, an essential operation to prevent possible ignition of explosive gas mixtures when containers have been used for oils, etc. They are then tested under pressure to locate any damaged sections, and those in need of repair are segregated, while the rest are painted and finished for resale.

Welding the damaged barrels is comparatively simple. The testers mark the leaky sections for the oxy-acetylene operator, who welds on an average of 40 barrels and drums a day. Some, of course, require more work than others, but it is only rarely that the damage cannot be repaired with the blowpipe. It has been found that rather than using drawn iron welding rods, ordinarily used on light sheet iron, better results can be obtained by using a bronze filler rod. Quicker, cheaper and better work can be done with the bronze rod, since bronze has a lower melting point and can be more easily handled than drawn iron. As the repaired barrels are painted, the initial bright color of the bronze weld is no objection.

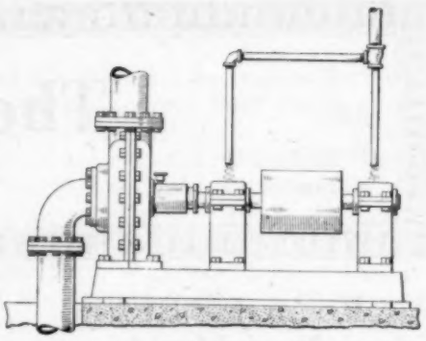
Regardless of whether the damage consists of a split seam or crack, the barrels are restored through oxy-acetylene welding to as serviceable a condition as those which are received undamaged. Even if a section of the side is missing, it may be satisfactorily patched with a piece of scrap steel sheet. After welding, the repaired barrels are tested a second time before they are painted and stored for future sale.

Spring Kiln Hoops

The alternative contraction and expansion of brickwork in kilns, chimneys and flues exposed to intense heat at intervals necessitates adequate provision against loosening and collapse. This provision usually takes the form of steel hoop bands, held together by bolts. During periods of high temperature, these are placed under considerable strain; when low temperatures are reached again, the contraction of the brickwork is likely to result in the slippage of the hoops and the collapse of the structure. To minimize danger from this cause it has been found an advantage in some instances to



SPRING KILN HOOP



Water pipes in position to protect bearings from corrosion

equip the loops with heavy springs, as shown in the accompanying cut. If desirable, each band may be provided with two bolts and two springs, to equalize the strain.

Bearing Corrosion

A Simple Method of Preventing Corrosion of Centrifugal Pump Bearings

Centrifugal pumps are very frequently used to pump materials which are distinctly corrosive to the rotor and shell, but more particularly to the bearings. Stuffing boxes do not seem to keep the bearings of even the overhung type of pump from being chewed up with certain types of liquids.

A crude but effective method was worked out to eliminate to some extent the excessive corrosion which in the case of one strongly alkaline liquor was very great. It meant daily attention to the bearings and frequent recasting. A small stream of water was allowed to flow on the outside casing of the bearing. This does two things. In the first place, it keeps the bearings cool and thus cuts down chemical action (on the principle that the rate of reaction is halved for every 10 degrees of temperature drop). In the second place, and more important, the water dilutes the corrosive liquid to an extent that makes it innocuous and non-corrosive.

The accompanying diagram shows the way it is done. Small water pipes are run down to a point just a few inches above the bearings and hardly more than a dribble of water is needed.

In actual, traceable results this stunt was convincing. The life of the bearing was increased by from three to four times and with the alkaline liquor which had to be handled that made a very appreciable difference—a difference which showed upon the mechanics' payroll.

Machinery and Appliances for Production and Control

Equipment News

From Maker and User

Materials and Accessories for Chemical Industries

Pump Valves

Users of pumps will be interested to know that some improvements in pump valve construction are announced by the Worthington Pump & Machinery Corporation, of New York. An entirely different form of valve has been perfected which, when applied to service conditions that have been hard for the older standard valves by causing them to cut and to leak, will eliminate the difficulties. It therefore increases the average pump efficiency, decreases the cost of pumping, and continually maintains the capacity of the pump at its maximum point.

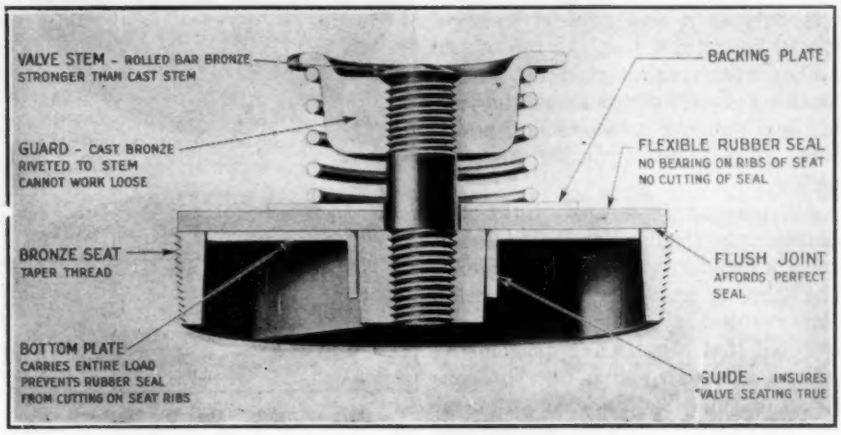


FIG. 1—NEW WORTHINGTON VALVE

Every user of pumps knows of the money loss taking place every day due to leakage through the pump valves when used for severe service conditions. This has led one prominent manufacturer who makes pump valve rubbers as well as other mechanical rubber goods to say in one of his pieces of advertising literature:

"It is a fact that there is more real economy—more actual saving of money—in the use of a first-quality pump valve than in any other one item in the entire mechanical rubber line. We are absolutely sure that this is true."

After many years of building and operating pumps the Worthington engineers now claim that the principal cause of leakage is traceable to the excessive wear on the rubber, which while negligible in some cases is often quite bad. Thus, Fig. 2 shows a photograph of a hard rubber valve after 3 months of particularly hard service. Cracks and cuts caused by the valve seat and by the radiating ribs are plainly visible. Fig. 3 shows a medium rubber also after 3 months of unusually difficult service. It is plain that the only way positively to prevent leakage with valves in this condition is to remove the rubbers and replace them with new.

To overcome this rapid and costly wearing, cutting and cracking action, there has been evolved the new type of valve shown in Fig. 1, known as the Worthington "Seal" valve for use when the conditions are too hard for the ordinary form of valves now in standard use.

This new valve assures absolute tightness when closed, because, as will be noted, the rubber used is flexible and will always seat perfectly both at the hub and outer rim, its inner and outer seats, and so keep tight. Age and continuous usage do not cut grooves or cause cracks, as demonstrated in Fig. 4, which shows a flexible rubber seal used for a year in this new type of valve. At the end of the year there was no visible wear; there was no leakage; renewal was of course unnecessary; and there was no cost for repairs.

The simplicity of this valve is evident on inspecting Fig. 1. There are no screws, no bolts, no rubber rings, no nuts, no bushings, no rotating elements. The special new feature that makes this valve good for hard service is the rubber valve proper. When the valve is closed the middle seat carries the entire

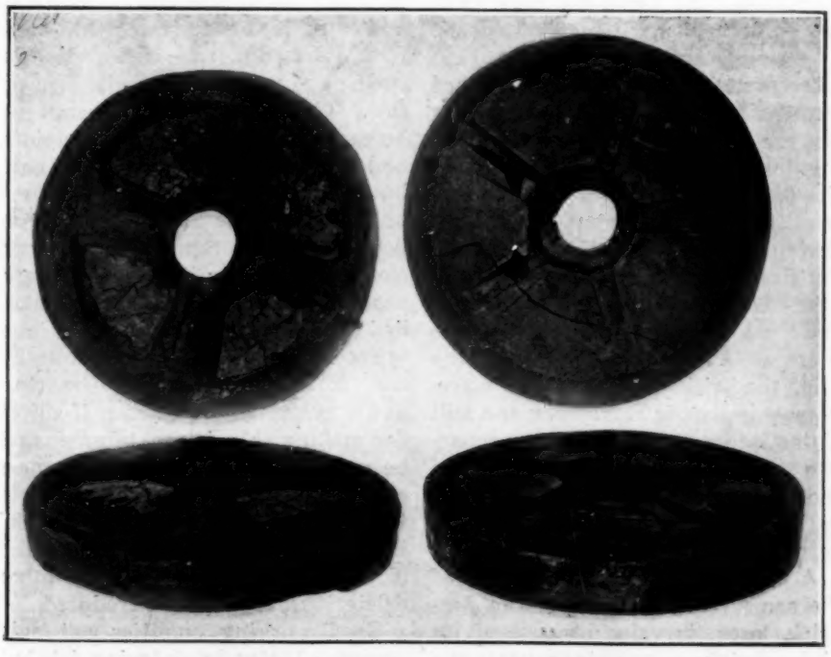


FIG. 2—HARD RUBBER VALVE AFTER 3 MONTHS' HARD USE

FIG. 3—MEDIUM RUBBER VALVE AFTER 3 MONTHS' HARD USE

load and prevents the rubber seal from cutting on the seats or ribs. This bottom plate moves up and down with the rubber, and so not only acts as a middle seat but helps to keep the rubber valve in shape even when open. Thus all mechanical functions requiring strength and wear resistance are cared for by metal parts. The flexible rubber acts only as a seal against leakage. It will be noticed that the top of the rubber seal is protected by a thin "backing plate," which keeps the rubber seal flat and prevents any possibility of wear from contact with the spring.

All moving parts are light but made amply rigid. The lightness assures a smooth, quiet-running pump. The rigidity prevents the distortion that results in leakage. It is not expected that repairs or replacements will be often required, but the construction makes this easy when it does become necessary, and the cost of any possible repairs will be low because of the simplicity and inexpensiveness of all parts.

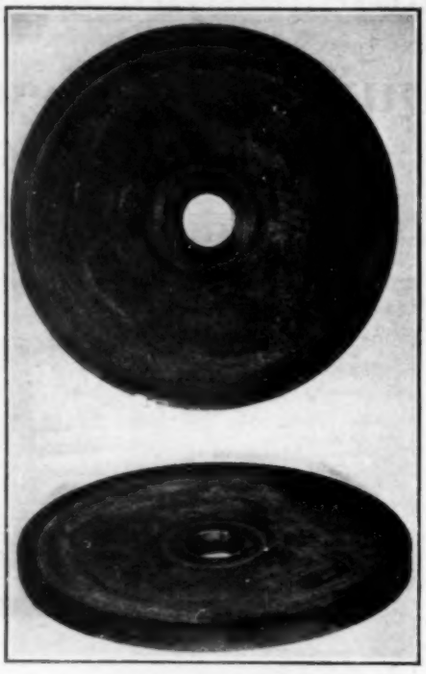


FIG. 4—NEW VALVE AFTER A YEAR'S USE

Requirements of a Refractory Mortar

BY ROBERT F. LINDSAY
Research Department, Denver Fire Clay Co.

The apparent need of a better refractory mortar for laying fireclay refractories has resulted in the introduction of a number of so-called refractory cements of varying worth. After 2 years' study of refractory mortars under furnace conditions, the Denver Fire Clay Co., in perfecting its Hi-Fire Bond, found there were certain requirements necessary to the production of a satisfactory bond. A discussion of these essential qualities will be of interest to every user of refractories.

The first specification of a refractory mortar, to be used within the temperature range of a No. 1 firebrick, is that it should be refractory—in other words, having a melting point close to that of the brick with which it is used. Fireclay mortar will stand this test, unless it has been mixed with materials such as the low fusing loams to reduce its shrinkage or cause it to fuse to the bricks; then its value as a refractory mortar is lost. This same fault is found in many of the trademarked cements. To eliminate shrinkage and obtain a cold bonding strength, large quantities of foreign materials are added, and as a result the most important requirement—refractoriness—is sacrificed.

Hardening in the cold is of no especial advantage, and should be avoided unless it can be accomplished without eliminating some of the more necessary qualities. Gross misstatements as to the melting points of some of the specially prepared refractory mortars has led to the distrust by many users of all refractory mortars. One refractory cement tested recommended by the manufacturer for use up to 3,300 deg. F. melted at 2,300 deg. F. Unless a mortar has the necessary high melting point the bond it forms is caused by a slag forming between the brick. The result is that under a continued high heat the mortar will flow from the joints, scoring the wall and leaving the joints open to the action of the flames. Ashes and clinkers will readily cling to the slag, further reducing the resistance of the wall. Settling and distortion of the wall under continued heat will also result and in arch construction or where there is a shearing action on the joint the brick will slip out of place. A mortar that is refractory and will sinter into a mass similar in properties to the brick itself is the desired one. It is not a strong, hard joint in the cold that is wanted, but a hard, refractory bond under heat.

A good milled fireclay, although of the same refractoriness as the firebrick, loses its value because of its high shrinkage. This causes the joints to become loose and all the ill effects of a loose setting will result. A satisfactory mortar should have a low shrinkage so that it will stay put. Again, this should not be accomplished by the formation of a slag, for refractoriness must be maintained.

The expansion and contraction of the mortar in relation to the brick are important. They should be the same or approximately those of the firebrick at varying temperatures, otherwise conditions nearly as bad as those obtained from using a mortar with a large shrinkage will occur. When silica is used as a base for the mortar, spalling and loose joints usually result, because its expansion and contraction are not the same as the brick. One of the methods used to correct this fault (and silica is used a great deal as a base because of its low cost) is to use basic fluxes, but here again the slag method of bonding is wrongly introduced.

Not only should the physical properties of the bonding material be like that of the brick but the chemical properties should be similar, having the same resistance to the furnace gases, ashes, etc., with which the brick might come in contact. A mortar that fires to a body similar in structure to the refractory bodies with which it is used and of similar chemical qualities will best meet this requirement.

In attempting to reduce shrinkage and maintain refractoriness we had difficulty at first in producing a mortar that possessed workability. A cement, though otherwise good—that is, sandy in nature—lacks plasticity and with it the desirable thin well-filled joint cannot be made. Uneven laying and waste of material also result. The wet prepared cements can be easily used in making thin joints, and they usually harden in the cold, but this hardening takes place not only in the joint but in the mortar box, on the workman's hands and clothes and often in the containers, causing loss of material and dissatisfied workmen. Although a thin joint is recommended, it is at times necessary to use heavy layers of mortar, and a wet prepared mortar, if suited for making thin joints, often cannot be used for the heavier joint unless some foreign material is used to thicken it. Good foreign material to add is not always available, and if the wrong material is used another deleterious factor is introduced.

Good working qualities not only assure a better brick-laying job but a considerable saving of material.

Readers' Views and Comments

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The editors invite discussion of articles and editorials or other topics of interest

A "Gentlemen's Agreement" Against Technology?

To the Editor of Chem. & Met.:

SIR—There are many members of the chemical profession whose careers are threatened today by a certain vicious practice that appears to be growing in American industry. This practice consists in what is called a "gentlemen's agreement" among manufacturers in a certain industry not to employ a technical expert who has left the employ of a concern engaged in the production of the same or a similar product or at least not without the permission of the last employer. I believe there is just such an agreement in existence among certain manufacturers of artificial silk, certain dyes, abrasives, caustic soda, etc. It probably originated in the idea once entertained by many that valuable trade secrets would be carried away by the technical expert who would then sell them to a competitor and thus enable him to produce a better or cheaper article.

The probable effect on the manufacturer has been for him to increase research to a certain point, and then stop and wait for his competitor, in the meantime enjoying a feeling of security in the possession of the results of this research. The effect on the chemical profession, however, has been literally to enslave many individuals in positions at salaries frequently far incommensurate with the profitable results they achieve. They cannot help themselves, because their experience is specialized and cannot be sold on the open market due to the "gentlemen's agreement" among the possible employers. The technical man is thus often penalized for having given meritorious service and he has no alternative but to continue the drudgery or to leave and enter work in a different line—work in which his experience will probably be of little use. Actually in this event the original employer has locked up the expert's experience where it will be of practically no value to himself or to the public.

Any solution to this vital problem in ethics which has not the good of the public and justice at heart would, of course, be wrong. On one hand we have increased the desire of the manufacturer for research, and on the other we have killed or limited the incentive of the man who does the research through a highly arbitrary agreement that may limit his rewards, his success and his career. Notwithstanding the fact that genius exacts its own reward, the majority of even so learned a profession as ours are not geniuses. And the effect on the public is indirectly, if you wish, to pay the bill for research, which, if it has been done at all, has not been as fruitful in benefits to mankind as it would have been were a proper incentive given the researcher. Such a stimulus would follow only from an opportunity to sell his special abilities on a free and open market.

It is all right to have trade secrets. It would be well if there were more real ones and less imagined ones. But when trade secrets limit the progress of the men who have created them, they limit the public good that comes from such progress; and any agreement, gentlemanly or ungentlemanly, is vicious which allows this state to exist.

MILTON J. SHOEMAKER.

Buffalo, N. Y.

Corrosion of Rust-Proofed Iron and Steel

To the Editor of Chem. & Met.:

SIR—The article by W. P. Wood on "Corrosion of Rust-Proofed Iron and Steel" in your April 30 issue contains conclusions which I feel are hardly justified by the data furnished. I refer to the statements made regarding chlorine in tap water, particularly to the assertion that the tap water he used contained dissolved chlorine. In determining the chlorine-consuming capacity of sewages for the city of Cleveland, done by the city's engineering department in 1919-1921, controls were always used of tap water and distilled water. We invariably found that tap water (which had been previously chlorinated by the city's water department) has a chlorine-consuming capacity as great as and usually greater than its oxygen-consuming capacity, given the same time and equal molecular amounts at the start. Our data indicated a fairly close relationship between the two. The tap water he cites had an oxygen-consuming capacity of 2.7 parts per million when he received it; therefore I feel quite sure that any chlorine which had been introduced at his local water plant was completely and chemically dead by the time it reached him, for we found that organic matter oxidized by chlorine is exceedingly stable. Furthermore, a dosage of chlorine sufficient to saturate the consuming power of the water and leave an analyzable excess at the consumer's tap is indeed a rarity.

It is quite likely that the "chlorine" which he lists under "constituents" refers to combined chlorine as chlorides, because a dosage of 7.6 p.p.m. is considerably more than twice as much as is necessary to give a very pronounced taste to water and is probably close to ten times the average dosage. That amount would accomplish 75 per cent disinfection or better in an ordinary city sewage.

Before rightly ascribing to chlorine the differences found in corrosion there should be run another set of samples in an unchlorinated water having the same constituents. When that is done, it is probable that the mineral salt content of the water will be blamed rather than a little chlorine long since dead.

GLENN GREEN.

Pathological Laboratory,
Lakeside Hospital,
Cleveland, Ohio.

To the Editor of Chem. & Met.:

SIR—The writer wishes to point out that his conclusion in connection with the corrosiveness of tap water was reached as a result of the tendency of this water to cause pits in the metal. The importance of this was definitely mentioned in the article. A rigid comparison of weight losses would not lead to this conclusion in all cases, but the pitting was quite evident.

Always granting the possibility of analytical errors and the fact that the figures for chlorine are considerably higher than the average, the case in question is somewhat unusual in that the samples were taken at a point not far from the purification plant. There is admittedly a considerable variation in chlorine content at this point. Further, the nitrogen content of the raw water is very low, and while the chlorine which has been added to the water might be, as it were, "bacteriologically dead," it is very questionable whether it is "chemically dead." The writer has been informed by a member of the laboratory whose duty it was to check this water regularly that positive tests for free chlorine by the orthotoluidin method were obtained within a radius of several miles from the purification plant. There is also on many occasions a pronounced taste to the water.

In conclusion, it might be well to point out that the mineral salt content of this particular water would be practically a negligible factor as far as corrosion of metals is concerned.

WILLIAM P. WOOD,
Assistant Professor of Metallurgical Engineering.

University of Michigan,
Ann Arbor, Mich.

Was It an Impurity?

To the Editor of Chem. & Met.:

Sir—Back in 1880-81 Dr. Edward G. Acheson was at work in the Edison laboratories, pegging away at carbon filaments. In his search for new modifications he undertook to break up carbon compounds by electrolysis. He chose carbon bisulphide, which he put into a test tube, and in this inserted two platinum wires. But the CS_2 would not conduct the current until he had shaken it up with water; then it became a partial conductor, its conductivity increasing as the current passed through it.

While no carbon appeared, he observed occasionally the deposit of small white granules at the bottom of the carbon bisulphide. What were they?

He separated them until he had about half a gram. They were very hard; they made scratches on sapphire.

Another curious feature was that when a granule of the substance at the bottom of the test tube containing CS_2 was brought between the platinum electrodes there developed a flash of light—and then the substance turned black.

The next step was to call, in company with his friend Dr. Edward L. Nichols, on the late Mr. Tiffany at his great jewelry establishment, then on Union Square. Hailing from Menlo Park, they obtained an audience without delay. Mr. Tiffany sent for his diamond expert, who proved to be a tall young man named Kunz—none other than our old friend Dr. George F. Kunz. He said if they would return in a couple of hours he would tell them what they had. But when they returned young Mr. Kunz admitted that he did not know. "It is not carbon," he said, "because it dissolves readily in hydrofluoric acid. But if you can make it in quantity and at a low cost it will be of great use to the world as an abrasive!" This was just 10 years before Dr. Acheson made carborundum.

But what were those granules? Mr. Acheson became assistant chief engineer for the Edison interests in Europe in 1881. In Paris he met an eminent German chemist whose identity has passed into the limbo of forgotten names. He described the experiments to him.

"Hah," exclaimed the eminent German chemist, "here you have another proof that sulphur is not an element. You have obtained, sir, a decomposition product of sulphur itself, which I have long claimed cannot be an element!"

Now we meet another difficulty. The voltage was 104, reduced by lamps in series and the current increased until the lamps glowed a dull red. But 20 years afterward Dr. Acheson tried to produce those same granules from carbon bisulphide in his laboratory. He used all the diligence and all the strategems at his command, without getting a sign of them in a single instance! What was the stuff?

ELLWOOD HENDRICK.

New York City.

Review of Recent Patents

Developments in the Manufactured Gas Field

Attention of Inventors Indicates the Industrial Importance of This Fuel

THE NORMAL PROCEDURE in manufacuring water gas or similar gas is to keep the CO at a maximum and the CO_2 at a minimum, because CO_2 is an incombustible. However, if the carbon were all changed to CO_2, the increased yield in hydrogen would give the gas a higher thermal value, as a study of the thermal reactions will show. In the usual method of water-gas manufacture, a certain per cent of CO will always be formed, however. In this invention of Harold R. Berry of Wilmington, the object is to supply a means for oxidizing all the CO and freeing all the hydrogen. The simplest form is an ordinary water-gas set, to which has been added, directly over the generator, through which the make must pass, a chamber containing a grate. On this grate are placed shavings, strips and borings of, say, steel and iron, or any other suitable substance.

These substances react with the steam to form an oxide, thus releasing all the hydrogen. In its turn, in the presence of CO, the oxide releases oxygen, which reacts with the CO to form CO_2, the scrap being rejuvenated. The chief requirement of this scrap is that it have a relatively large surface

American Patents Issued June 5, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,457,339—Kiln and Burner Therefor. M. Bassler, Milwaukee, Wis.

1,457,343—Rubber Mixer or Like Machine. D. R. Bowen, Ansonia, Conn., assignor to Farrel Foundry & Machine Co., Ansonia.

1,457,351—Air Filter. L. L. Dollinger, Rochester, N. Y.

1,457,406—Depth and Specific-Gravity Measuring Apparatus. C. W. Stancliffe, New York, assignor to Pneumercator Co., New York.

1,457,413—Machine for Treating or Processing Fabrics and Other Goods. J. A. Wilson, Elizabeth, N. J., assignor to Duratex Corp., Newark, N. J.

1,457,436—Process of Making Metal Sulphides. Henry Howard and E. B. Alvord, Cleveland, Ohio, assignors to Grasselli Chemical Co., Cleveland.

1,457,484—Method of Purifying Acid Liquor. F. C. Atkinson, Indianapolis, Ind.

1,457,493—Process of Making Phosgene. D. B. Bradner, Edgewood, Md.

1,457,503—Method of and Apparatus for the Purification of Water. W. M. Cross, Kansas City, Mo.

1,457,514—Filtration Chamber. J. W. Flower, Detroit, Mich., assignor to Michigan Valve Foundry & Engineering Co., Detroit.

1,457,521—Powdered-Coal Apparatus. A. J. Grindle, Chicago, Ill., assignor to Grindle Fuel Equipment Co.

1,457,522—Powdered-Coal Apparatus. A. J. Grindle, Chicago, Ill., assignor to Grindle Fuel Equipment Co.

1,457,543—Nitrating Aromatic Hydrocarbon. S. P. Miller and J. R. Hess, Philadelphia, Pa., assignors to The Barrett Co.

1,457,656—Process of Desulphurizing Petroleum and Petroleum Distillates. A. E. Dunstan and E. B. Thole, Sanbury-on-Thames, England.

1,457,676—Process of Making Sulphuric Acid and Apparatus Therefor. F. G. Stantial, Melrose, Mass., assignor to Merrimac Chemical Co., Woburn, Mass.

1,457,709—Explosive. C. J. Stautsböll Lundsgaard, Vejen, Denmark.

1,457,718—Electric Furnace. I. R. Valentine, Erie, Pa., assignor to General Electric Co.

1,457,780—Gas-Fired Melting Furnace. H. O. Loebell, New York, assignor to Doherty Research Co., New York.

1,457,786—Recovery of Gasoline From Natural Gas, etc. E. S. Merriam, Marietta, Ohio.

1,457,791—Process of Making Succinic Acid. J. F. Norris and E. O. Cummings, Cambridge, Mass.

1,457,792—Process for Obtaining Sulphur. R. S. Perry, Cave Springs, Ga., P. W. Webster, Pelham Manor, and V. K. Boynton, New York, assignors to Perry & Webster, Inc.

1,457,794—Settling Apparatus. W. E. Piper, New Canaan, Conn., assignor to Dorr Co., New York.

1,457,803—Apparatus for Separating Solids from Liquids. A. J. White, San Antonio, Tex.

1,457,810—Screening Apparatus. P. J. Alwart, Chicago, Ill.

1,457,811—Displacement Element for Liquid Containers. L. E. Baker, Fort Wayne, Ind., assignor to Wayne Oil Tank & Pump Co., Fort Wayne.

1,457,835—Process for Producing Catalytic Material for Hydrogenating Unsaturated Oils and Fats to Harden Them. J. P. Harris, Chicago, Ill., assignor to Allbright-Nell Co., Chicago.

1,457,848—Agitator. T. Mojonnier, Oak Park, Ill., assignor to Mojonnier Bros. Co., Chicago.

1,457,865—Apparatus for Comminuting, Refining, and Triturating Paper or Cardboard Pulps. K. A. Thorsen, Grenoble, France.

1,457,877—Recovery of Ammonia. L. E. Doty, Elyria, Ohio.

1,457,915—Method of Making Paper Pulp. B. S. Summers, Port Huron, Mich.

1,457,934—Method of Making Precipitated Barium Sulphate and Sodium Sulphydrate. J. B. Pierce, Jr., Charleston, W. Va.

1,457,935—Method of Making Precipitated Barium Sulphate. J. B. Pierce, Jr., Charleston, W. Va.

1,457,941—Cooler for Reclaimed Liquor and Gas in Paper-Pulp Processes. G. F. Shevlin, Glens Falls, N. Y.

1,458,001—Method of Burning Sulphur. A. T. Prentice, Somerset West, Cape of Good Hope, South Africa.

1,458,016—Method of Treating Siliceous Ores. G. H. Wigton, Eureka, and S. M. Seddon, Salt Lake City, Utah.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

—that is, that it be finely divided. (1,453,655, Harold R. Berry, assignor to Petroleum Research & By-Products Co., Wilmington, Del., May 1, 1923.)

Retort for Low-Temperature Gas Making

The efforts along the line of low-temperature carbonization and gas manufacture have been of increasing interest. One of the pioneers in this field was the International Coal Products Corporation. It is now putting forward a patent covering a new type of primary retort in connection with its well-known process.

This particular design, the patent of Charles E. Richardson (1,454,338, Charles E. Richardson, assignor to the International Coal Products Corporation, Richmond, Va., May 8, 1923), is concerned with the structural details of this type of retort. It claims to improve the support of the retort, to improve the design so that it may be more easily assembled and disassembled, and to improve the arrangement of both burners and flues.

Coking Non-Coking Coal

One of the greatest desiderata of the byproduct coke and gas field is an oven that will coke certain high-volatile coals of low agglutinative power and give good results. A solution of this difficulty is offered by Paul Goffart (1,455,527, assigned to Belgian-American Coke Ovens Corporation, Wilmington, Del., May 15, 1923).

This patent claims that in order to convert coal of this type into dense coke, distillation must be rapid at the top of the charge, thus preventing the formation of sponge coke at the top. To accomplish this result, the vertical heating flues are divided into pairs of adjacent flues. The fuel gas is admitted at the top at a point between the flues of each pair. The air for supporting combustion travels upward in one flue of each group and the gases of combustion pass downward in the other flue of the group. From time to time a reversal occurs as between these two flues. Means is provided for regulating both the length and the intensity of the flame. In this way a controllably higher heat may be maintained at the top of the oven than elsewhere.

Doing Away With Reversing Engines

Designers of coke ovens have long sought for a means of eliminating the reversing engines. The expense and added complication due to these mechanisms and the repair cost which they entail are sometimes a serious burden.

As a means of accomplishing this end William E. Roberts has obtained a patent (1,453,605, assigned to Foundation Oven Corporation, New York, May 1, 1923) on an oven of novel type. In this oven the flues are arranged in pairs, vertically. Gas and air enter at the bottom of one of the flues of each pair, burn up this flue and down the next, the products of combustion passing out through the waste gas ducts. The combustion flues of one tier of flues are adjacent to the waste gas or downward flues of the next tier, which is designed to assist in heat distribution.

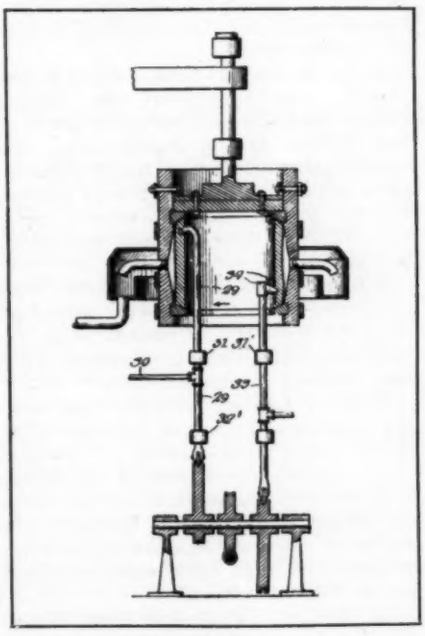
The waste gas ducts are common for all the waste gas flues of one tier of flues. The air passages for admitting the air are located on the sides of the waste gas ducts and their parallel length is sufficient to preheat the entering air thoroughly.

It will be noticed that this design of oven permits continuous combustion without reversal and does away with regenerators.

Patented Ideas in Chemical Engineering Equipment

A Continuous Centrifuge and New Plate for Column Stills Are Featured in Recent Patent Specifications

BROADLY SPEAKING, the use of centrifugal force in the separation of liquids from solids is a comparatively old process, although advances are being made continually in the equipment for applying this useful principle. Recently the trend has been toward developing and perfecting a continuous centrifugal separator, notwithstanding the fact that in certain of the chemical industries "batch" operation is sometimes of importance. For instance, it is frequently necessary to remove a



precipitate from a mother liquor, and then in order to obtain the desired degree of purity the solid must be washed free from the mother liquor while it is still in the rotor. A separator invented by Sylvester S. Howell and assigned to the United Chemical & Organic Products Co., of Chicago, takes advantage of both of these requirements, since it is suitable for either continuous or intermittent operation. A feature of this piece of equipment is the arrangement of introducing the material to be separated and the removal of the solid matter through the open bottom of the rotating cylinder or rotor. The solid may be conveniently removed through this open bottom of the rotor while it is in motion and the materials to be separated can be introduced into the cylindrical rotor without stopping it, thus rendering the separating operation continuous.

Two points of interest are the methods by which the material to be separated is fed into the centrifuge and the provision for withdrawing the solid cake or residue. Referring to the accompanying figure, it will be noted that the material from which the liquid to be separated comes in through the supply pipe 29 and the hose 30. This pipe is supported on bearings 31 and 32 and can be moved in a vertical direction as the material is sprayed on the filtering lining 24 while the latter is in rotation. The pipe 33 is provided with a nozzle through which compressed air is forcibly projected toward the filtering lining in a direction opposite to its direction of rotation. This nozzle produces a thin blade or jet of compressed air which is discharged upon the interior of the centrifugal rotor. By the operation of this sort of nozzle, the filter cloth or lining, when such is used, is maintained quite free of material, thus increasing the filtering capacity of the machine. This has the advantage over a mechanical scraper plow in that it is not possible with the latter to run very close to the inside surface of the cloth for fear of rupturing it. The pneumatic plow, on the other hand, is remarkably flexible. (1,453,678, issued May 1, 1923.)

A Still Plate With Check Valves

An unusual feature in the construction of diaphragm plates for a column still is brought out in a recent patent by Ralph H. Twining, of Marquette, Mich. (1,453,735, issued May 1, 1923.) Instead of the usual cup or sieve construction, provision is made for a diaphragm plate having a large number of perforations, in each of which is a rivet-shaped check valve. This valve consists of an ordinary rivet having its head normally resting on the upper surface of the plate and its stem projecting through the perforation. The pressure of the rising vapor in the column causes the heads of these valves to be lifted from their respective plates and the vapor is permitted to pass through the perforation. If the pressure of the vapor is

variable over the different portions of the plate, the valves in any portion not subjected to sufficient pressure will not be raised, as each of the valves is entirely independent of the other in its action. This is particularly important, as it prevents the escape of the fluid at points where the pressure is inadequate to support it.

Fighting Oil Fires

In fighting oil fires by means of a fire-extinguishing foam, it has been repeatedly found that when an explosion occurs in the oil tank—this being generally preliminary to the beginning of a fire where lightning is the cause—the roof or tank top is forced or blown off violently. The mouth of the foam delivery system attached to it is usually broken or put out of use, thus resulting in the failure of the fire-extinguishing apparatus. To overcome this objection, the delivery system for the foam is sometimes placed in the side of the tank above the "normal" oil level. This sort of installation, however, has the disadvantage that the normal oil level is never constant, and that a rise above the predetermined level will often result in the oil leaking into the foam delivery mixing chambers. Willis D. Witter, of Roselle Park, N. J., in a patent assigned to the Foamite Fire-Foam Co., of New York, retains the type of installation in which the foam is allowed to enter through the tank roof or top, but at the same time he makes provision so that in case of the violent removal of the tank top by an explosion, it will not disrupt or break down the foam delivery system. (1,454,839, May 8, 1923.)

To Facilitate Pipe-Line Pumping

In pumping heavier grades of petroleum through pipe lines, it is often found that the oils are so heavy and viscous that their handling is extremely difficult. In fact, some grades of oil are so heavy that it is practically impossible at ordinary temperatures to pump them through the pipe. Various means have been used to make the oil more fluid. John P. Persch, of Houston, Tex., has patented a process of agitating the oil in a cylindrical chamber connected with the pipe line and introducing into the oil during the process of agitation a strong blast of air. There is formed an emulsion of air and oil of considerably lower specific gravity than the original oil. If the air has previously been heated to a suitable temperature, it is claimed that it will have the effect of breaking up the hydrocarbon molecules to a certain extent and thus make the oil permanently more fluid and that it will not return to its original viscous state. The agitating apparatus consists of mechanically operated paddles attached to a central shaft. (1,454,485, issued May 8, 1923.)

Important Articles In Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. Those that are of unusual interest will be published later in abstract in this department; but since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

EXCESS AIR IN GAS-FIRED APPARATUS. J. M. Davies and T. T. Gill. Calculations given based on the CO_2 content of flue gases. *Gas Age-Record*, June 9, 1923, pp. 727-728.

CHEMISTRY—THE KEY TO INTERNATIONAL RELATIONS. H. E. Howe. The initial chapter of a non-technical, economic review of world significance of the science. *Chem. & Ind.*, May 25, 1923, pp. 510-13.

HYDROGENATION. E. J. Lush. Development of a new method and its demonstration in a small model oil-hardening plant. *J. Soc. Chem. Ind.*, May 25, 1923, pp. 219T-223T.

THE ACTIVATED SLUDGE PROCESS. Edward Arden and William T. Lockett. Results at large-scale demonstration of plant installed at Withington works of the Manchester Corporation. *J. Soc. Chem. Ind.*, May 25, 1923, pp. 225T-230T.

RECOVERY OF NITROGEN FROM SEWAGE IN ACTIVATED-SLUDGE PROCESS. Edward Arden, Clarence Jepson and Percy Grant. *J. Soc. Chem. Ind.*, May 25, 1923, pp. 230T-234T.

BUILDINGS FROM THE MANAGER'S VIEWPOINT (Part IV). G. L. H. Arnold. How the roof, partitions, doors and building equipment should be planned to fit the industry. *Management Engineering*, June, 1923, pp. 417-421.

Men in the Profession

JOHN DAVIS has been selected to take charge of experiments being conducted by the Board of Helium Engineers working under the Bureau of Mines on the government reservation at Fort Worth, Tex.

Prof. GRAHAM EDGAR sailed for Europe on June 11. While in England he will be one of the American representatives at the International Union of Chemistry.

J. N. GUNN of New York has resigned as president of the United States Tire Co. and vice-president of the United States Rubber Co., the parent organization. C. B. SEGER, president of the United States Rubber Co., has been elected to a similar position with the tire division, succeeding Mr. Gunn.

WILLIAM M. KEELING, who was graduated from the Missouri School of Mines in May, is now chemist with the American Smelting & Refining Co.'s lead refinery at Omaha, Neb.

EDMUND LEAVER, who has been serving as superintendent of the Bureau of Mines experiment station at Tucson, Ariz., has been assigned to the superintendency of the precious metal station at Reno, Nev. S. P. HOWELL, the bureau's specialist in blasting and explosives, has been made superintendent of the Tucson station.

R. WALTER LEIGH has been elected vice-president of the American Beet Sugar Co., New York, succeeding the late H. T. Oxnard.

J. M. LESSELL, research engineer, Pittsburgh, gave the principal address at the meeting of the local chapter of the American Society of Steel Treating, at the William Penn Hotel, June 5, on the subject "Methods of Static and Dynamic Testing of Metal."

CHARLES A. MEADE, vice-president of E. I. du Pont de Nemours & Co., Wilmington, Del., has resigned to devote his time to private enterprises. He became connected with the development department of the company in 1915, and in 1919 was elected vice-president and director.

E. C. MOFFETT, formerly with the Ideal Disinfectant Corporation, Woodbridge, N. J., is now with the Cyanide Co., Warners, N. J.

THOMAS W. STREETER has been elected chairman of the board of directors of the Simms Petroleum Co., N. Y., to succeed Harry Bronner, resigned.

W. H. WALKER, of the U. S. Department of Commerce, is in California conducting a survey of the agricultural needs of that state for nitrogen compounds.

Obituary

CLYDE MITCHELL CARR, until recently president of Joseph T. Ryerson & Son, Inc., died on June 5 at his residence in Chicago. Mr. Carr was born in Will County, Ill., July 7, 1869. For 12 years he was president, but for the last 4 years had been unable to take an active part and last January resigned as president, although continuing until the time of his death as a member of the board of directors.

Calendar

AMERICAN CHEMICAL SOCIETY, fall meeting, Milwaukee, Wis., Sept. 10 to 14.

AMERICAN ELECTROCHEMICAL SOCIETY, forty-fourth meeting, Dayton, Ohio, Sept. 27 to 29 (dates provisional).

AMERICAN ELECTROPLATERS SOCIETY, eleventh annual meeting, Providence, R. I., July 2 to 5.

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, summer meeting, Wilmington, Del., June 20 to 23.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS, iron and steel exposition, Buffalo, N. Y., Sept. 24 to 28.

AMERICAN SOCIETY FOR TESTING MATERIALS, twenty-sixth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 25 to 30.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH), New York, Sept. 17-22.

NATIONAL SAFETY COUNCIL, twelfth annual safety convention, Statler Hotel, Buffalo, Oct. 1 to 5.

Industry and Trade

Current News and Market Developments

Summary of the Week

Imports of chemicals and allied products in April were valued at $12,276,199.

Treasury Department has revoked anti-dumping order against calcium carbide from Province of Quebec, Canada.

Annual census of coal-tar products completed by Tariff Commission and will be sent to public printer about June 20.

Production of industrial alcohol for 9 months ending March, was larger than in fiscal year ending June 30, 1921.

Canadian decree prohibits manufacture and importation of oleomargarine in Dominion.

Sales of new crop crude cottonseed oil have been made on a basis of 7c. per lb. f.o.b. mills.

Resale offerings of phenol reached the market and the price declined to 42c. per lb.

Supreme Court denies application to review the decision in the case of the Mennen Co.

Case of government against the Chemical Foundation weakened by testimony of Polk. Court holds much evidence presented by government irrelevant. Defense to ask dismissal.

Dr. Samuel W. Stratton inaugurated president of M.I.T. with impressive ceremonies in which eminent scientists participated.

Canada to survey domestic heating problem from by-product coke.

Imported copper sulphate shows slight recovery from recent weakness.

Permanganate of potash sold at new low and is very irregular in price.

Export demand for caustic soda is very quiet and prices are subject to shading.

Several crushers of linseed have caught up on deliveries of oil and the market is approaching a normal supply basis.

Syndicate in Control of German Potash Industry

ADVICES coming from the American Consulate at Frankfort-on-Main state that rumors of attempts by American and Dutch interests to obtain control of German potash properties have brought out discussions on the potash situation in Germany. A prominent publication in Frankfort says that the object of the publication of these rumors is probably to arouse German interests in potash shares and to increase public confidence in the industry. Whenever the danger of foreign control is really felt, it is stated, preference shares are issued and taken over by the companies' members, each share granting the right of 10, and in some instances as many as 25 votes.

Falling off in orders in the German potash industry which began in December, 1922, continued throughout the first 3 months of the present year. In February certain quantities of potash were stocked by producers and full production was maintained, but in March the shutting down of several shafts was reported. The German Potash Syndicate complains that a late announcement by the government of price reductions in certain nitrogen fertilizers, accompanied as it was by the statement that a reduction in prices of other fertilizers would shortly follow, has unfavorably affected potash sales. The farmer was led to expect reductions in potash prices which, aside from certain usual summer rebates, it will be impossible for the syndicate to make without cutting prices below cost of production.

Export trade in March is reported to have been satisfactory, but this is declared to be doubtful. When export trade in potash is good, it is pointed out, few complaints of a poor domestic market are heard. The fact that the abolishment of export duties was urgently demanded is said to show that the export situation was not satisfactory.

The Berlin correspondent of the Boston News Bureau in an interesting report says: "German potash industry is very well organized. Its supreme controlling body, the Potash Syndicate, is compulsory in character and disposes of the out-turn of the individual mines according to their productive capacities. Therefore it is the goal of every member to acquire as many mines or mining claims as possible, to sell larger quantities through the syndicate, the more so as the latter also disposes of exportable surpluses. These circumstances have contributed to the creation of large combines, such as the Wintershall - Gluckauf - Sondershausen concern, which disposes of 40 per cent of the total German production; the Salzdetfurth concern, with 20 per cent, Burbach-Krugershall, Gumpel-Heldburg and Ronnerberg.

"The self-government of the industry is represented by the Imperial Potash Council, in which the interests of the farmers, the chemical and other consuming trades, along with those of the producers, are given full scope for all complaints, as in this potash parliament the prices, freights and expenses made up by the syndicate are scrutinized.

"There is another examining body, the object of which is to reduce number of shafts sunk to the needs of the industry, for, despite surrender of 17 big Alsatian works to France, the number of actual works now stands as 208, against 191 at the beginning of the war.

"Production of potash salts shows a big increase over pre-war figures, outstripping 1913 by 2,000,000 quintals annually apart from present Alsatian production of 1,100,000 quintals.

"Competition for the American market has led to conclusion of a contract with the Potash Importing Corporation of America in New York, which is believed to be backed by important American shipping and banking interests. The corporation's agents are to start a lively propaganda campaign among the farmers of the United States in the interest of spreading the use of potash salts as fertilizer. While the French Government grants bounties to exporting Alsatian firms in order to help them to gain a footing in overseas markets, the German Kali-Syndikat seeks to recapture the American market by allowing abatements to the corporation to the extent of 30 per cent or so of invoice amounts.

"The German-American potash contract is to run 5 years. The value of surplus of potash in Germany is calculated at $50,000,000."

Canada Prohibits Manufacture and Importation of Oleomargarine

Prohibition Measure Effective August 31—Expected to Curtail Canadian Demands for Vegetable Oils

THE Canadian Parliament has voted to put an end to the oleomargarine industry in Canada. War-time legislation that permitted the manufacture and sale of oleomargarine in Canada will expire on Aug. 31 this year. That is, the manufacture and importation of the product must cease on Aug. 31, but its sale may continue until March 1, 1924. While it is still possible for the government to bring in new legislation this session that would permit the people of Canada to use oleomargarine products, there is little probability that anything of the sort will be done.

Previous to 1917 oleomargarine was not allowed to be manufactured or sold in Canada. But when the war placed an unusual drain on the food supplies of the world, the Canadian Parliament permitted the manufacture and sale of the product. The main argument behind the agitation, which has been long and vigorous, is that it has been hurting the Canadian butter industry.

The oleomargarine question has engaged the attention of Parliament to an unusual degree this session and has provoked many long discussions as to its merits and demerits. The climax finally came during an all-night session recently. It was the end of an all-session lobby, with the dairying interests carrying on a persistent warfare against the commodity and the oleomargarine manufacturers almost equally active in support of it. It was not a party question, for the discussion saw W. S. Fielding, Minister of Finance, taking a position diametrically opposed to the Prime Minister, The Conservatives and the Progressives likewise were divided. In the last analysis, after 9 hours of strenuous debate, the antis won out by 125 to 54.

Laborites Fight for Oleo

W. F. Carroll of Cape Breton, who comes from a laboring constituency where a good many tons of the commodity are used in a year, put up a determined fight to have its manufacture and sale continued permanently. He argued that there was no more reason for dictating what a person should eat, so long as it was healthful, than there was reason for dictating the kind of apparel he should wear. He was supported by the Minister of Agriculture in the late government, Dr. Tolmie, who went into a microscopic analysis of the whole subject, treating it from the standpoint of palatability and nutrition and from other angles, and, though as a dairyman he would benefit by the prohibition, he upheld the right of the import and manufacture in the natural color.

The Prime Minister contended that the permit was only a war measure, involving a specific pledge to the dairy interests that when the war ended it would be abandoned. On the other hand, Mr. Fielding steered a course directly opposite to his chief, quite discounting the argument of any pledge to the dairymen and maintaining that the issue was on the merits and the vital question whether or not the intelligence of the Canadian people enables them to determine what they want to eat—butter or a substitute.

Butter Coloring Permitted

Dr. Tolmie reminded the House that butter makers were permitted to heighten the color of their butter in winter when it was a light color and low in vitamine contents as compared with summer butter. This gave no indication to the purchaser of the value of the goods in that respect. He further argued that during the war Canadian troops used oleomargarine; British troops used it, and now it was on the regular ration list of both the British army and navy. He urged that only half of the people of the world used milk and it was idle to say that the milk industry would be damaged by oleomargarine. As to cottonseed oil, which was one of the main ingredients of oleomargarine, this was used in salad oils and other edible products. There was much more to fear, Dr. Tolmie added, from the making of inferior dairy products than the making of oleomargarine. Since 1919 there had been 489 prosecutions against butter makers in Canada as against 48 oleomargarine prosecutions.

Arthur Meighen, leader of the Opposition, pointed out that in 1918 the government had permitted the sale of oleomargarine as a temporary measure under the war measures act. This was made plain in the legislation and at the next session the government recommended to Parliament that this temporary measure be continued as such. His own attitude was that the use of oleomargarine should be permitted. He did not see any reason why a genuine food should not be manufactured in Canada if the people wished it. He believed that there should be a fair protective tariff on the product. The United States had a duty of 8 cents against Canadian butter and 8 cents against oleomargarine. Why should Canadian dairymen have to compete against American manufacturers of butter substitutes in the Canadian market?

This action of Parliament is expected to have a decided bearing on importations of various vegetable oils into Canada. Large amounts of coconut, cottonseed, peanut and other oils are used in the manufacture of nut butters and margarines.

Dr. S. W. Stratton Inaugurated President of M.I.T.

Impressive Ceremonies With Many Eminent Scientists Present Mark His Taking Chair

On June 11 the attention of the academic world was focused on M.I.T. Dr. Stratton, former head of the Bureau of Standards, officially took the president's chair of the Massachusetts Institute of Technology at that time. Speakers of note were present to address the large body of faculty, students and alumni gathered at Horticultural Hall, where the ceremonies took place.

Frederick P. Fish acted as master of ceremonies at the inauguration. Major-General George O. Squier spoke with feeling of his 15 years' close association with Dr. Stratton in connection with army problems. For the faculty, Prof. Edward P. Miller greeted the new president, pledging co-operation and firm loyalty. Governor Channing Cox glorified the commonwealth of Massachusetts in having such an institution, with such a faculty, within its bounds. The founders of Technology, Mr. and Mrs. William Barton Rogers, received a tribute from President Emeritus Charles W. Eliot of Harvard. Professor C.-E. A. Winslow of Yale represented the alumni at the ceremonies. He voiced the sincere admiration and respect of that body for the new president of their alma mater and emphasized the immense potentialities of the scientific spirit in solving industrial and social problems. Dr. John Campbell Merriam, president of the Carnegie Institution of Washington, expressed the regret of Dr. Stratton's colleagues there at losing his constant association. He spoke at length of the new president's qualifications, emphasizing the fact that he is a thoroughly constructive scholar. In his own address, to which reference is made elsewhere in this issue, Dr. Stratton stressed the effect of science in the evolution of industry.

Banquet at Algonquin Club

In the evening the new president acted as toastmaster at a banquet at the Algonquin club. Dr. A. Lawrence Lowell, president of Harvard, Prof. Edgar Odell Lovett and Prof. Theodore W. Richards were among the speakers at this gathering. Professor Lovett, of the Rice Institute in Texas, spoke of education in that state. Professor Richards presented greetings from the Royal Society, the Royal Institution and the Chemical Society of London. President Ira Nelson Hollis of Worcester Polytechnic Institute, an old friend of Dr. Stratton, spoke in praise of the man "who, if he can persuade Congress to support the Bureau of Standards, is well equipped to meet Tech's problems."

Professor Allard of the Ecole Normale Supérieure of Paris, Dean Kimball of Cornell, Dr. Zook of the U. S. Bureau of Education and Dean Clark of the University of Illinois also spoke. The prevailing theme both of the day and of the evening is discussed editorially on page 1060 of this issue.

Chemicals on Free List Form Major Part of April Imports

Total Imports for Month Less Than in March, but Larger Than in April, 1922

IMPORTS of chemicals and allied products during April were valued at $12,276,199. Of that amount $8,598,464 represents the value of imports not subject to duty. Imports on the dutiable list totaled $3,677,735. The free list imports are less by $1,500,000 than those in March. There was a falling off of about $150,000 in the total value of imports on the dutiable list. In April of 1922 the value of free list imports was $5,528,218, and of dutiable imports $3,003,094.

The value of imports of coal-tar chemicals was $1,196,248 in April, a decrease of $250,000 over the imports of March, but still a slight increase over the total imported in April of 1922.

The value of paints, pigments and varnishes imported during April was $348,807. This is a slight increase over March, when $300,525 were brought into the country. Imports of these commodities, however, are measurably less than they were in April of 1922. The value of fertilizers imported in April was $7,033,299, a decrease of $800,000 as compared with March, but double the value of the imports in April of 1922. Nitrate of soda alone contributed $4,898,762 to the April total. This is nearly five times the rate of imports in April, 1922, but imports in March were valued at $5,691,097.

Some of the individual items which show marked changes in the trend of imports in April of last year are as follows:

	April, 1922	April, 1923
Creosote oil (gal.)	3,270,081	4,621,537
Naphthalene (lb.)	274,815	1,789,425
Toluene (lb.)	337	122,460
Quinine salts (oz.)	123,096	.....
Quinine sulphate (oz.)	.....	185,928
White arsenic (lb.)	.....	1,476,066
Formic acid (lb.)	.....	144,292
Oxalic (lb.)	18	129,737
Sulphuric (lb.)	.....	3,402,917
Nitrate of ammonia (lb.)	.....	910,613
Arsenic sulphide (lb.)	1,348,280	207,750
Barium compounds (lb.)	.....	974,553
Glycerine (lb.)	221,905	1,821,602
Cyanide of potash (lb.)	282,360	597,627
Carbonate of potash (lb.)	242,542	.....
Sodium cyanide (lb.)	2,566,195	1,445,643
Calcium cyanamide (tons)	1,441	3,906
Sulphate of ammonia (tons)	601	.....

The figures are those of the Department of Commerce. Due to the great amount of additional work occasioned by the passage of the new tariff bill, these figures still require more than the usual time to compile. Progress is being made, however, and the April figures were prepared on the department's work sheets less than a month later than required for the task of compilation prior to the passage of the new tariff act.

German Goods Free From Export Regulations

Exporters Must Quote in High Exchange but Accept 40 Per Cent in Paper Marks

Cable advices from Berlin recently announced that export price control, export taxes and licensing of a number of general classes of German goods had been abolished by the Federal Economic Council. Further details are now available and show that the decree became effective on May 27.

Among the articles specifically mentioned as free from the previous export regulations are: All vegetable fiber, except flax; animal fats, waxes and products; liquid resins, aromatic greases, solid tanning extracts; all hides, leather goods, excepting hairy hides; all rubber goods; fish oils, bristles, horn, antler, bone, hoof, whalebone, shells and their products; tanning bark and logs; mineral gums; mineral oils and products.

It is also added that export prices must be quoted in high exchange currency, and at least 40 per cent of the resulting credit must be surrendered to the Reichsbank, which in turn reimburses the exporter in paper marks at the current rate.

Maine Offers Paper Courses in Summer School

The chemistry department of the University of Maine will conduct a summer school course in pulp and paper chemistry and technology from June 25 to Aug. 4.

The work given is designed to meet the specific needs of students who desire and are qualified to take pulp and paper courses and also for pulp and paper mill men who may or may not have technical training, but who have had practical experience and desire to gain a scientific knowledge of important phases of pulp and paper manufacture and testing or phases of work with which they are unfamiliar.

All work completed will be given the regular university credit for either the bachelor's or master's degrees. Transference of credits to other institutions will be arranged for as during past years for those so desiring.

The courses to be offered this summer give an option of six different subjects, whereas in former years only three have been given. Three courses are offered to those interested in pulp and three to those interested in paper. Anyone wishing to take part pulp work and the rest paper may do so providing the courses do not conflict.

Supreme Court Upholds Mennen Co. Price Policy

The application of the Federal Trade Commission for a writ of certiorari in the Mennen Co. case was refused last Monday by the United States Supreme Court. This means that the decision of the Circuit Court of Appeals will not be reviewed. The original complaint against the Mennen Co. was filed April 15, 1920 and was amended Jan. 27, 1921. It alleged that the company, in addition to being guilty of the general charge of unfair methods of competition, also was operating in violation of section 5 in classifying its customers into two groups according to a basis of selection by allowing to purchasers of the same quantity and quality of its products different discount rates, according to the classification of such purchasers. On March 3, 1922, the commission entered a cease and desist order against the Mennen Co. The respondent appealed, and the United States Circuit Court of the Second District held adversely to the commission.

The decision of the Supreme Court is regarded as very important, as the case will be regarded generally as a precedent and establishes that a manufacturer may adopt price schedules that seem fair to him and may select its own customers and distinguish between wholesale and retail branches of the trade.

Larger Sales of German Potash

The German Potash Syndicate in 1922 sold 1,295,579 tons of pure potash, says the annual statement of the Deutsche Kaliwerke. This is an increased output over 1921, when 921,147 tons was produced. The 1922 sales in Alsace are estimated at 250,000 tons. About 50,000 tons K_2O was produced from all other sources.

The annual statement points out that had the normal pre-war increase continued, 1922 sales should have aggregated 2,400,000 tons, or 800,000 tons more than the 1922 sales. The 1922 sales were divided 74.4 per cent inland and 25.6 per cent export. The statement comments on the improved sales to Poland and to the United States. The "closing down law" has been extended until July 1, 1924.

The statement reveals that 181 plants contributed to the 1922 production throughout the year. In addition there was some contribution from 22 other plants.

Coal-Tar Census Completed

Final tabulations of the annual census of coal-tar products and synthetic organic chemicals have been completed by the Tariff Commission. W. N. Watson, acting chief of the chemical division, expects to send the report to the public printer about June 20. It is probable that a summary of the census, in the form of a press release, will be made public before the complete report comes from the printer.

Government Suit Against Foundation Making Little Progress

Evidence Produced Largely Regarded as Irrelevant by Court—Request for Dismissal of Suit Likely in Near Future

THE SECOND WEEK of the federal court trial of the government's suit against the Chemical Foundation has produced no startling developments. Very much of the evidence produced by Assistant Attorney-General Henry W. Anderson, who is pressing the case for the government, is regarded as irrelevant by the court. Frank L. Polk, who was Under Secretary of State during the Wilson administration and who signed the order making valid the sale of the disputed 4,800 patents to the Chemical Foundation, upset the assertion of Anderson that he was duped into the deal. As a result the case of the government is regarded as being much weakened. Dismissal will probably be asked by the defense at next week's session.

The legal point upon which the case hinges is the right of the courts "to review executive discretion." The defense argues that such a right does not exist. The court apparently holds the same view. That being the case, the arguments of the government, which are based on the assumption that the opposite view should hold, lose much of their significance. In reply to a direct question by the court as to why he signed the order Mr. Polk said:

"Because I felt here was an opportunity to build up a real chemical industry in this country, something we had never had before."

Further on, Mr. Polk said that he thought it was a wise plan to turn these patents over to the Foundation to make American industry independent. The witness added that he knew of no suppression of facts relative to the seizure of the patents. The charge made that President Wilson did not realize the significance of the act of sale of the patents to the Foundation was likewise refuted by the evidence of Mr. Polk.

Nitrate Patents Under Fire

Introducing documentary evidence Colonel Anderson endeavored to prove that the idleness of Muscle Shoals is due to the refusal of the Foundation to grant patent rights to the government, except under conditions which the government insists made it impossible to go ahead with its development plans. He contended that the program of the War Department was seriously impaired by the failure of A. Mitchell Palmer, as Alien Property Custodian, to sell the department patents it required for "offensive and defensive" purposes. In effect, it was charged that the government was "double crossed." After assuring the War Department that it would receive the patents it needed for war and peace purposes, including Muscle Shoals, Palmer sold them to the Chemical Foundation.

Isidor J. Kresel, counsel for the defense, asserted that the War Department asked only for licenses; that the Custodian had granted the Navy Department licenses on 5,700 patents that never went into the hands of the Foundation, and that the Haber patents, which the government said were necessary to the Muscle Shoals development, were not necessary to that project.

Friendly Litigation Attacked

Colonel Anderson tried to make a big point out of a proposal by Ramsey Hoguet, former patent attorney for the Alien Custodian, that the Foundation and the government engage in friendly litigation. But even here the points emphasized by the government were minimized by Judge Morris. The court has already indicated a number of times its intent to hold with the defense that war acts of a President are not reviewable by the courts. On this principal contention rests the fate of the suit in equity.

Hammermill Offers Fellowship

The Hammermill Paper Co., through its chemical director, Dr. Bjarne Johnson, has offered to the trustees of the New York State College of Forestry a fellowship for the coming year (September, 1923-24) to be known as the "Hammermill Fellowship in Pulp and Paper Manufacturing."

The fellowship requires that the recipient be a graduate student at the college (his work leading to the degree of M.S.). His major problem, which is to be chosen jointly by the Hammermill company and the department of forest chemistry, is to be of fundamental nature.

Burton L. Kassing, of Utica, N. Y., a member of the graduating class, has been designated by the company and the college as the recipient of this honor.

Germany Using Ash Fuel

With the idea of reducing fuel costs, the German chemical industries have been advised to recover combustible carbon from old ash piles. The occupation of the Ruhr has resulted in such increases in fuel costs as to make it impossible to produce certain chemical products in competition with world prices.

Under ordinary conditions, one-sixth of the carbon content of coal passes into the ash. The percentage is much higher in the coke used at smelters and gas plants. Under present conditions in Germany it is believed that many large ash dumps can be reworked at a profit. It also indicates the determined effort the Germans are making to keep their chemical industry alive.

Lime to Get Main Efforts at Non-Metals Station

Impossible to Carry On Research in Several Fields Because of Small Staff—Slate Follows Lime

The principal problems to be undertaken on the opening of the new non-metals experiment station of the Bureau of Mines at New Brunswick, N. J., will be a continuance of the study of the difficulties met with in the quarrying and preparation of limestone and in lime manufacture, and a continuance of the work which has been in progress at the Tuscaloosa station on mineral fillers.

The work necessarily will be limited, as the appropriation permits of the employment of three technical men only. Since considerable work has been done on lime and mineral fillers, it is felt that the greatest good can be accomplished by carrying through the work already well in hand.

In lime the most important portion of the work probably centers around efforts to utilize waste. There is reason to believe that improved methods of burning can be brought to the point where the smaller sizes can be burned.

It is possible that some work on slate will be taken up early in the life of the station. This is encouraged by the success which has attended large-scale pulverization of waste slate, and the increasing demand for this material as a filler in asphalt, roofing materials, paint and rubber.

The problems of the non-metals are of such a character that field work is required in much larger proportion than laboratory work. The studies and the experiments must be carried on under operating conditions. For that reason Oliver Bowles, who will be in charge of the new station, believes it is better to expend the appropriation in a way that will allow all necessary field work. Consequently he must limit the personnel of the station to a mineral technologist and a physical chemist. In case cooperative arrangements can be made with the industries concerned, it will be possible to expand the work further.

Calcium Carbide Order Revoked

The Treasury Department has revoked its order against calcium carbide from the Province of Quebec, Canada, issued May 16 under the anti-dumping act, and has instructed collectors to disregard the order and to discontinue any pending proceedings which may have been started by its authority.

It is understood that the anti-dumping order was issued as the result of suspicion by an appraiser at a border port that a consignment of calcium carbide from Quebec was invoiced at too low a price, indicating that it had been sold for export at less than its fair value. Canadian producers protested the order and at a hearing before Judge McKenzie Moss, Assistant Secretary of the Treasury in charge of customs, convinced customs officials that there was no dumping of the chemical.

Washington News

African Company Has Large Soda Deposits

A report from Consul W. L. Jenkins says that the Magadi Soda Co., at Lake Magadi, Kenya Colony, Africa, has a property covering 90 square miles, including the lake area of 34 square miles of carbonate of soda. There are very few natural deposits of soda in the world, and in this one the percentage of pure soda is as high as 96. The supply is practically inexhaustible, owing to the rapidity with which the soda re-forms. A prominent employee of the company states that only 4 square miles have been worked since operations began in 1912-13, and that by the time work was begun on the third square mile the first already had re-formed.

The Magadi company has a capital of over £2,000,000. It suffered greatly during the war, but present prospects are much brighter. It now has a capacity of 6,000 tons a month, which was expected to be increased to 12,000 in March or April of this year. The proposed increase is all the more striking since customs figures show that total exports of soda amounted to only 16 tons in 1913, 12,061 tons in 1919 and 12,829 tons in 1921. The values for these 3 years are given as £1,200, £269,258 and £107,166, respectively.

Shipments to the United States began in 1922 and tend to increase. The other principal markets are England, the Netherlands, Denmark, South America and Japan.

April Output of Acetate of Lime Shows Decline

The Department of Commerce announces the April production of acetate of lime and methanol based on reports received by the Bureau of the Census in co-operation with the National Wood Chemical Association.

The following table shows total comparative figures for the first 4 months of 1923, as reported by firms with a daily capacity of 4,500 cords, or prorated to that capacity in months where some reports were lacking, taken from the *Survey of Current Business:*

	Production		
1923	Acetate of Lime Thous. of Lb.	Methanol Gallons	Stocks of Wood End Month Cords
January	16,544	933,171	833,767
February	13,894	733,179	807,782
March	15,569	831,784	769,174
April	13,575	738,059	746,626

Argentine Tariff Revision

A report from Buenos Aires states that a proposal has been submitted to the Argentine Congress for an increase of 50 per cent on customs import valuations, and recommending also the exemption from import duties for lumber and certain other construction materials, as well as industrial machinery.

Gain in Industrial Alcohol Production

Because the production of industrial alcohol during the 9 months ended with March reached a total of 48,857,894 wine gallons, Prohibition Commissioner Haynes, in reviewing the administration of the Prohibition Unit of the office of the Commissioner of Internal Revenue, holds that "this clearly demonstrates that the administration of the alcohol laws, by this unit, has interfered in no way with normal commercial processes." He points out that trade alcohol production in those 9 months was greater than during the 12 months of the fiscal year beginning July 1, 1920.

"The number of plants now qualified to produce alcohol," says the Prohibition Commissioner's report, "is practically the same as 2 years ago, or about seventy in number, but at present they are working at a greater capacity than they were then."

The report gives the following figures covering withdrawals of specially denatured alcohol: During the 12 months ended with February, 1923, 25,505,940 gal.; during the corresponding period ending February, 1922, 12,719,452 gal.; during the corresponding period ended with February, 1921, 11,767,587 gal. The figures for completely denatured alcohol follow: During 12 months ended with February, 1923, 22,766,389 gal.; during the corresponding period ended with February, 1922, 15,483,003 gal.; during the corresponding period ended with February, 1921, 13,319,230 gal.

Standards Augments Staff

The Bureau of Standards has just appointed two additional chemists to be members of its sugar laboratory research staff. Dr. C. S. Hudson, who has done a great deal of work on rare sugars and organic chemical research in connection with these substances, will join the bureau organization shortly to continue his researches in this field. The Corn Products Refining Co. has appointed Dr. H. Berlin as a research associate in this same organization. He will be engaged on physical chemical research in connection with starch and its hydrocarbon derivatives. The work of this section of the bureau is directed by Dr. F. J. Bates.

Appraisers Sustain Protest on Soap

Perfumed toilet soap, assessed at 40c. per lb. and 60 per cent ad valorem under paragraph 48 of the tariff act of 1913, should have been assessed at the rate of but 30 per cent ad valorem under paragraph 66, according to an opinion just handed down by the Board of United States General Appraisers, sustaining a protest of Park & Tilford.

Rarer Chemicals Require Greater Protection

Applications for increases in duty on amino acids and rare sugars have been filed with the Tariff Commission by the Special Chemicals Co., Highland Park, Ill. No action has been taken by the commission.

Amino acids are included in the basket clause of paragraph 5 of the tariff act of 1922 at 25 per cent ad valorem. They are used to supply missing elements in certain foodstuffs and as medicinals. Rare sugars are in paragraph 504 of the tariff act at 60 per cent ad valorem. They are used principally in laboratory bacteriological tests.

While the total volume of each consumed in the United States is small, due to their uses, they are said to be highly important to medical science and the development of a domestic producing industry is viewed as of importance by military medical officers.

Germany is the principal competitor in the production of these acids and sugars. In the case of both, the protection given by the 1922 tariff act is described by the applicant as ineffectual. German rare sugars, for instance, are laid down in this country $25 per pound cheaper than the cost of production in the United States. The application asks that the duties be transferred from foreign valuation to American valuation, which would leave the figures in the act the same but would increase the duties several hundred per cent.

German Plant to Produce Synthetic Urea

A report from D. S. Haven, consul at Leipzig, states that during the war the Germans erected near Merseburg, in the Province of Saxony, the great chemical plant known as the Leuna Works. This establishment covers an area of approximately 1½ square miles and employs 18,500 men. It was designed for the purpose of extracting nitrogen from the air. This product was intended exclusively for agricultural purposes. Present plans are to devote a large portion of the plant to the manufacture of synthetic urea by the Haber and Bosch processes. It is probable that the urea will be converted into the nitrate of urea containing 46.6 per cent of available nitrogen, which the Germans claim will be the principal source of nitrogen in the fertilizers of the future.

New Resin Found in Mexico

A report from Mexico City announces the discovery of a new resin in Mexico. This resin is said to be suitable for commercial purposes and is taken from a tree known by the name of "Cuapinole," found in the tropical zone of Mexico. When analyzed the resin was found to be of such quality that it can be used in the manufacture of the finest varnishes. One of the features of this new resin is that it is not soluble in either alcohol or gasoline.

Trade Notes

The J. A. & W. Bird Co., Boston, Mass., has been formed under state laws with a capital of $200,000, to succeed to and expand the plant and business of the company of the same name, with offices at 88 Pearl St. The company specializes in the manufacture of glue, floor oils, etc., and the new charter provides for the production of chemicals, paper products, etc. Reginald W. Bird is president; John B. A. Regnier, vice-president; and Adrien E. Regnier, treasurer.

A receiver has been appointed for the Joslin Schmidt Co., Cincinnati, O., manufacturer of chemicals and fertilizer, on application of the American Oak Leather Co. Liabilities are stated as approximately $400,000, and assets $1,290,000 "depreciated valuation."

The American Can Co. will build two large additions to its plant at San Francisco. The improvements will include a manufacturing and storage building as well as an office building.

H. A. Forbes, 81 Fulton St., New York, has been designated as agent of the recently formed Potash Importing Co. of America, which is a Delaware corporation.

A special meeting of the Paint, Oil and Varnish Club of New York has been called for June 26. The meeting will be held during and in connection with the annual outing of the club and will be held for the purpose of considering applications for membership.

George S. Whitty, chemist for 28 years at the Brooklyn plant of Devoe & Raynolds Co., Inc., resigned on June 1 to take charge of production for the Amalgamated Paint Co., Jersey City, N. J.

The erection of a refinery and the mining of asphalt at Flint, Ala., is contemplated in the near future by the Southern Rock Asphalt Co., according to an announcement made by L. D. Powell, Alabama manager of this concern. At present Mr. Powell is directing a series of "core-drilling" tests near Flint and stated that several samples of the Alabama asphalt had been analyzed and found to be even richer than the Kentucky deposits owned by the same company.

Henry H. Stiller, formerly with the Superfos Co., is now associated with the Wishnick-Tumpeer Chemical Co., in the capacity of manager of the New York office which has been opened at 130 West 42d St.

The Scientific Chemical Co., 141 West 36th St., New York, has been petitioned into bankruptcy. Susan Brandeis has been appointed receiver.

During April Singapore exported 4,500 long tons of refined tin, of which the United States took 68 per cent.

Germany's Zinc Dust Industry Explained by Commissioner Grey

Uses of This Commodity, Imports, Exports, Producing Firms and Interesting Sidelights in His Report

AN INVESTIGATION made with the co-operation of chemical engineers, brokers in chemical products and consumers of zinc dust, as well as with the aid of technical periodicals and handbooks, has yielded information with regard to zinc dust which is of considerable value to the industry in this country.

This product is extensively manufactured in the United States, Great Britain, Germany, Belgium, Holland and Australia. The commercial product is generally impure and contaminated with lead, iron and cadmium, as well as with zinc oxide. The so-called pure product is made by a very limited number of firms in Germany and contains a varying percentage of zinc oxide. The price is adjusted according to the oxide content.

Recent official import and export statistics are available only for the period covered from 1910 to 1912, inclusive, and 1920 to the beginning of 1923.

Germany's chief source of supply before the war was Belgium. The quantities imported from all sources gradually diminished to 650 tons in 1912. The figures rose to 1,238 tons in 1922, with Belgium being the origin of 459 tons and Polish Upper Silesia 667 tons. Before the Versailles treaty what is now Polish Upper Silesia was part of Germany, and products originating there were not considered imports. At the present moment more than 50 per cent of the imports are from that source.

The imports as officially published appear below:

Country of Origin	1910	1911	1912
Belgium	920.4	687.3	514.6
Austria-Hungary	226.1	79.9	119.7
Polish Upper Silesia	.....	.....	.....
Other countries	.....	.....	.....
Total metric tons	1284.6	787.9	650.6
Value million marks	0.578	0.378	0.338

Country of Origin	1920	1921	1922
Belgium	.....	.....	458.9
Austria-Hungary	.....	.....	.....
Polish Upper Silesia	.....	.....	666.6
Other countries	.....	.....	112.5
Total metric tons	65.1	30.8	1238.0
Value million marks	.....	0.123	323.0

U. S. Formerly Heavy Buyer

Before the war the United States was Germany's heaviest buyer of zinc dust, but as the home production in America rose from 69 tons in 1910 to 11,339 tons in 1920, the exports to the United States dwindled to 1,030 tons in 1912, with no figures given thereafter. A resumption of statistics occurs in 1920, but for that year and for 1921 the exports of zinc dust are merged with those of zinc oxide (Zinkgrau and Zinkasche). There is no special grouping of the United States as an export outlet after 1912, the only practical inference being that it is included in the group of "other countries."

In 1922 Germany exported only 603 tons, which is less than 14 per cent of the 1912 record. Deducting this quantity from her total imports of 1,238 tons during the same year leaves 635 tons for her home consumption, a figure significantly close to the 666 tons which Germany imported that year from Polish Upper Silesia, part of her former empire.

It is interesting to follow the suggestion of the loss to Germany of the resources of this commodity as represented in the separation of Polish Upper Silesia. In 1910 Germany exported 1,806 tons more of zinc dust than she imported. The source of this overplus was unmistakably what is now Polish Upper Silesia and the Aix la Chappelle region, occupied by the Belgians under the Versailles treaty. The suggestion is strengthened by the figures for 1911, when the exports overbalanced the imports by 3,161 tons and in 1912, when the same item was 3,696 tons. The situation may be studied with more exactness by consulting the export table below:

Country of Destination	1910	1911	1912
Belgium	203.3	154.5	535.4
Denmark	30.4	103.6	83.4
Great Britain	660.2	609.8	833.4
Netherlands	150.6	171.8	700.8
Austria-Hungary	246.3	325.8	327.4
Switzerland	107.3	164.5	39.0
British So. Africa	1.0	132.9	93.4
China	34.7	108.7	158.2
Mexico	11.5	393.7	82.0
U. S. A.	1435.2	1359.5	1030.4
Japan	.....	.....	.....
Sweden	.....	.....	.....
Other countries	(a)	.....	.....
Total metric tons	3091.2	3949.1	4346.7
Value in thousands of marks	1,391	1,853	2,040

Country of Destination	(b) 1920	(b) 1921	1922
Belgium	572.5	49.6	.....
Denmark	.....	.....	.....
Great Britain	.....	.....	.....
Netherlands	1915.7	1630.8	207.7
Austria-Hungary	109.2	138.1	.....
Switzerland	.....	.....	.....
British So. Africa	.....	.....	.....
China	.....	.....	48.5
Mexico	.....	.....	.....
U. S. A.	.....	.....	.....
Japan	.....	.....	63.4
Sweden	694.4	80.1	.....
Other countries	969.4	921.5	283.9
Total metric tons	4261.2	2820.1	603.5
Value in thousands of marks	19,254	15,988	100,717

(a) The totals of German exports are not always the aggregates of the component items, but should be preferred to any true sum of the detailed items. Exporters make their entries in the export declarations and these are relied upon in making up the individual items. However, the totals recorded at the end of the year represented the exact aggregate shipped out of the country.

(b) The figures for 1920 and 1921 include both zinc dust and zinc oxide.

Among the manufacturers in Germany producing pure material there are the following: Kahlbaum, Adlershof-Berlin; Merck, Darmstadt; Schuckert, Gorlitz; Hohenlohenhuette, Upper Silesia; Gische's Erben, Breslau.

In England the main manufacturers are: H. S. Willcocks & Co., Manchester; Keeling's Oxides (est. 1921), Ltd., 35 Surrey St., London, W. C.; May & Baker, Battersea, London; Prescott & Co., Rutland Mills, Hulme, Manchester

News Notes

Harvard University is to have a new chemical laboratory. A gift of half a million dollars from Edward Mallinckrodt, Sr., of St. Louis, is to be used for the new building. Three such buildings are regarded as necessary to provide ample laboratory facilities at the university.

Henry Ford has recently acquired the right to utilize the High Dam on the Mississippi for a period of 50 years. It is understood that Mr. Ford is planning to manufacture storage batteries for his cars at his St. Paul plant, which is near the dam. The estimated output of the plant is 6,000 batteries per day.

The Swedish glass industry, which has suffered much through foreign competition, is now recovering and activity is being resumed at most works. Both window and plate glass plants are affected. A few of the smaller establishments which rose during the war have not opened up and, according to a Reuter dispatch, probably never will.

Formulation of standards, specifications and tests for purchases of materials is being sought by the Department of Commerce at the request of state agents and representatives of private institutions. Meeting in Washington on June 11, delegates from all interested technical and business associations along with agents from 26 states conferred with Secretary Hoover with regard to the matter.

Natural gas can flow across state lines whether or not the government of the state which contains its source decrees that it may. A decision to this effect was arrived at in a verdict rendered by the Supreme Court on June 11. Ohio and Pennsylvania thereby lost a case presented against the state of West Virginia.

The soft drink industry is the United States is assuming tremendous proportions. Approximately 4,000,000,000 bottles of beverages so classed are being consumed annually. This industry is creating a large market for carbon dioxide, tartaric, citric or phosphoric acid and artificial fruit sirups.

Germany's unmined potash resources contain two billion tons of K_2O, an estimate recently published by the German Foreign Office states. This is apart from about 300,000,000 tons of K_2O in the unmined Alsatian deposits.

The oxygen enrichment committee, of which M. H. Roberts is chairman, met in the office of Dorsey A. Lyon, assistant director of the Bureau of Mines, on June 9. The committee spent the day reviewing the report submitted by F. W. Davis. The report deals with the use of oxygen or oxygenated air in metallurgical and allied processes. Before publication, the report will be submitted to the industry for criticism or suggestion.

All necessary funds have been secured for the construction of a ceramics building at the Georgia School of Technology, Atlanta, and work will be placed in progress at an early date. The structure will be the first institution of its kind in the South.

The Franklin Institute, Philadelphia, Pa., has commenced the remodeling of four old structures at 19th and Race Sts., to provide a new research laboratory department at the institution. The work will be carried out under the direction of the Henry W. Bartol Research Foundation of the Institute, and complete equipment will be installed for general research in the field of physical science. A total of twenty individual laboratories will be provided for experimental research. It is expected to have the extensions ready for use when the institute celebrates its one hundredth anniversary early in the fall.

Plans for 1923 Exposition Taking Shape Rapidly

The 1923 chemical industries exposition may be turned into a huge "buying fair" if plans discussed by the advisory committee on June 6 develop. The central idea of the scheme is to have each exhibitor display his goods in a novel manner so worked out that it will demonstrate their particular characteristics, special uses and selling points. Full sales forces of those having exhibits would be present, according to the plan, in order to attend joint as well as company conferences. Contacts resulting from such conferences were pointed out to be very desirable.

Major H. S. Kimberly, who has charge of the educational exhibits this year, provided a tentative report at the meeting. The chief object of the exhibits will be to demonstrate to the business man what chemicals can do and are doing, and, so far as possible, the place of chemistry in business. Kitchen and food chemistry are not to be neglected. Both the Chemical Warfare Service and the Bureau of Chemistry are planning exhibits for educational purposes. The actual educational work, which is to be carried in the form of a practical course in chemistry and chemical engineering, is to be in charge of Dr. W. T. Read of Yale University. Authorities in various branches of the science are to give the lectures which will cover the entire week of the exhibition.

Announcement was made at the meeting on June 6 that there will be a joint meeting of the advisory committee with all exhibitors on June 28. Those present at the last meeting included Dr. Charles H. Herty, chairman; Raymond F. Bacon, John W. Boyer, Henry Howard, Percy C. Kingsbury, T. C. Oliver, R. P. Perry, Charles F. Roth, H. J. Schnell, C. Wadsworth, T. B. Wagner, R. Gordon Walker and Milton C. Whitaker.

Southern California A.C.S. Elects Officers

At the May meeting of the Southern California Section of the American Chemical Society, held at Los Angeles on May 24, the following officers were elected for the ensuing year: President, Walter A. Schmidt; vice-president, Dr. W. C. Morgan; secretary, Mark Walker; treasurer, C. J. Martin; councilors, Dr. S. J. Bates, H. L. Payne and E. R. Miller. Mr. Payne was elected chairman for a second term. The secretary reported that the average attendance at the dinners held during the past season was 103, and the average attendance at the lectures was 144.

After the business meeting the following papers were read and discussed: Dr. I. Grageroff, "Fundamental Problems in Biological Chemistry"; Dr. H. L. White, "Chemical Nature of Some Physiological Products"; Dr. M. C. Terry, "Relation of Chemistry to Medicine From the Standpoint of the Bacteriologist."

Explosion Study at Carnegie

A study of the factors causing mine explosions will be undertaken at Carnegie Institute of Technology, according to an announcement outlining a program of research on coal-mine problems. The study of mine explosion causes will be divided into investigations of (*a*) modification of Stokes law for settling of coal dust particles; (*b*) time-pressure relations in dust explosions; (*c*) conductivity and specific heat of coal; (*d*) static charges in coal mines; and (*e*) effect of electric field in propagation of explosions.

Six college graduates will be appointed to research fellowships to conduct the investigations in co-operation with the U. S. Bureau of Mines and an advisory board of Pittsburgh coal operators and mining engineers.

Steel Treaters Nominate

The following officers have been nominated for the American Society for Steel Treating for the coming year and nomination is substantially equivalent to election, as only a single candidate has been formally proposed for each office: For president, George K. Burgess, director, Bureau of Standards; for second vice-president, R. M. Bird, engineer of tests, Bethlehem Steel Co.; for treasurer, Zay Jeffries, metallurgist, Aluminum Co. of America; for member of board of directors, J. Fletcher Harper, research engineer, Allis-Chalmers Manufacturing Co.

New Calcium Arsenate Producer

The Salt Lake Insecticide Co., of Salt Lake City, Utah, is now producing calcium arsenate, and shipments of carload lots are being made to the cotton states of the South. The distribution of the company's product has been placed in the hands of Howard W. Ambruster, 261 Broadway, New York, as exclusive sales agent.

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices
Imports and Exports
The Trend of Business

Improved Inquiry for Chemicals Early in Week but Interest Not Sustained

Domestic Products Fairly Steady in Price With Foreign Offerings Feeling Effects of Forced Liquidation

DIFFERENT sellers reported an improved inquiry for chemicals in the first half of the week, but later on buying interest lagged and the market closed in a quiet condition. Some of the large consuming trades are going on summer schedule and reports from the tanning and textile industries especially indicate a slowing up in operations. This has the effect of retarding inquiries for forward deliveries and makes trading for prompt and nearby positions more important.

The weighted index shows a fractional decline for the week but this was due to weakness in imported materials and a lower selling price for linseed oil. Important domestic chemicals were practically unchanged in price during the period and large amounts are passing against old contracts. Prussiates of foreign make have maintained a downward course and new lows were reached for both the soda and potash varieties. Imported copper sulphate was very weak at the close of the previous week and this weakness was carried into the current period but distressed lots were gradually absorbed and prices reacted from the low level. Domestic copper sulphate has sold freely despite the competition from imported.

Export demand for chemicals has been very moderate, and caustic soda has been forced to meet with competition which forced sellers either to lower prices or to remain out of competition. Some export inquiry is heard for bichromate of soda, but nothing like the volume noted earlier in the year.

Arsenic and calcium arsenate hold a position of prime interest, but the week was devoid of new developments and outside of a general expectancy that demand will suddenly improve, there is little to note. Prices are easy, but most holders are waiting to see if stocks on hand will be needed and are slow to force matters. It is admitted by many that prices will show a decided trend one way or the other within the next two weeks.

Acids

Acetic Acid — Several consuming trades are reported to be buying in fair volume and stocks have been well absorbed. New outlets are said to have been developed especially for the lower grades. Prices are on a steady basis with quotations at $3.38@$3.63 for 28 per cent; $5.48@$5.75 for 30 per cent; $12@$12.75 for glacial.

Boric Acid—Sellers say that prices already are so close to production costs that further declines are improbable. Demand has been good and evidently buyers have been impressed by the low level of prices. Export business also has been stimulated while imports of crude material are a factor in increasing selling competition. Prices for powdered and crystals are 10@10½c. per lb., in sacks, with kegs at 11@11½c. per lb.

Citric Acid — Weather conditions again have not favored active buying but in some quarters better interest has been reported. Spot material is meeting with some price cutting as a few holders are eager to move stocks. The open figure for spot offerings is 52c. per lb., but sales have been made under that level. Domestic grades are held at 49@50c. per lb., but stocks of domestic are well sold ahead.

Prussiates Reach Lower Price Levels—Imported Copper Sulphate Firmer—Caustic Soda for Export Lower—Permanganate of Potash Very Weak—Arsenic Waiting for Improved Demand—Imported Tartaric Acid Easy—Resale Lots Weaken Nitrate of Soda.

Hydrofluoric Acid—There is no activity in the present market but sellers say this is a seasonable condition. Prices are easier but this fails to arouse consuming interest. Quotations are 6@7c. per lb. for 30 per cent; 10@11c. per lb. for 48 per cent; 13@14c. per lb. for 60 per cent.

Oxalic Acid—The importance of imported grades is seen from the fact that in April last year only 18 lb. came into this country whereas in April this year there were imports of 129,737 lb. Chief interest still centers in imported offerings with prices varying from 13c. to 13½c. per lb. according to seller. Domestic acid is held at 13½c. per lb. at works.

Sulphuric Acid—As confirmation of the sold up condition of domestic producers in recent months it is noted that in April imports of sulphuric acid amounted to 3,402,917 lb. as compared with nil in April 1922. Buying is not as heavy as formerly but movement to consumers is large enough to hold stocks at low levels. Prices are steady at $9.50@$12 per ton for 60 deg. and $15@$16 per ton for 66 deg. in tanks. Oleum is in limited supply and $19@$20 per ton is quoted for tanks, f.o.b. works.

Tartaric Acid—The position of domestic has undergone no change and the open market price is held at 37½c. per lb. Imported has been on the market in larger volume and prices have weakened under selling pressure. Sales are said to have been closed at 35½c. per lb. on spot and it was stated that this figure could still be done.

Potash

Bichromate of Potash—Reports from the large consuming trades indicate lessened activity and this is reflected in the market for bichromate. In some quarters prices are quoted as firm at 11½c. per lb. and upward according to quantity but there is not much trouble in locating stocks at 11½c. per lb. and the latter is regarded as an actual trading basis.

Caustic Potash—While some sellers say that 7½c. per lb. could have been done throughout the week, others were inclined to hold above that level and 7¾c. per lb. is quoted in different directions. Shipment prices also are given at 7¾c. per lb. but buying is not in evidence and this is regarded as a bar to any sustained firmness in price. Domestic caustic is maintained at 9c. per lb., works.

Carbonate of Potash—Stocks have been reduced by recent transactions but inquiry is dull and it still is a buyers' market. Large lots are not moving but scattered trading is reported for smaller amounts with 80-85 per cent quoted at 6½@6¾c. per lb. Hydrated 80-85 per cent is steady at 7½@7¾c. per lb. On offerings of 90-95 per cent 6¾c. per lb. can be done and on 96-98 per cent 7@7¼c. per lb. is asked.

Cyanide of Potash—There has been very little call for this material in recent weeks and business has been confined to jobbing lots. Prices are irregular with a range according to seller, the inside price being 47c. per lb. and up to 50c. per lb. is asked.

Permanganate of Potash—The position of permanganate is shown by the fact that sales were made last week

at 17c. per lb. whereas 19c. per lb. is quoted by many holders of stocks. Irregularity in price has been a feature for some time and there is no indication that the market is approaching a more stable position. As a matter of fact distressed lots were said to have changed hands last week at 16c. per lb. which emphasizes the difference in views of sellers. Some of the material held on spot is said to have originally cost from 18½c. to 21½c. per lb. to import.

Prussiate of Potash—Yellow prussiate was one of the weak selections on the market. Buyers have been holding off and sellers have pressed matters with the result that values weakened and spot material was offered as low as 31c. per lb. The price ranged from this level up to 35c. per lb. but the latter figure was purely nominal.

Sodas

Bichromate of Soda—In spite of reports of differences in price according to seller, competition is keen enough to hold values on an even basis and 8½c. per lb. is regarded as a general price for carlots at works. Demand is not heavy but sellers say large amounts have passed on contracts and new business has been satisfactory. High cost of production is still heard as a steadying factor on prices and as surplus stocks are unusually light the market seems to be in a healthy condition.

Bisulphite of Soda—A quiet week was reported for both powdered and liquid. Consumers are buying only for current needs and this confines transactions to jobbing quantities. Prices are given at $1.40@$1.50 per 100 lb. for liquid and $4.25@$4.50 per 100 lb. for powdered.

Caustic Soda—Export business has fallen off to such an extent that it is difficult to quote a definite figure as representing the market. On outside brands $3.18½ per lb. was heard but no business was reported at that price and with actual business in sight it is possible that lower prices could be worked. Open quotations were placed at 3.20c.@3.25c. per lb., f.a.s. On standard brands 3.35c. per lb. is still held as an open asking price but it is admitted that business is impossible at that level and it would require definite bids to determine just how much the quotation will be lowered on actual business. The domestic branch of the trade is fairly good with 2½c. per lb. asked for carlots, f.o.b. works. Spot material also is holding unchanged at 3½c. per lb. and upward according to quantity.

Cyanide of Soda—A lot of 25 tons now afloat was offered at 21c. per lb. Low priced lots on spot appear to have been cleaned up and 22c.@23c. per lb. was asked for spot material. For nearby shipment from abroad it was possible to do 20c. per lb. but this was qualified by the statement that this price was subject to cable confirmation.

Nitrate of Soda—The market is suffering because of fairly heavy offerings and little disposition on the part of buyers to operate. Resale lots are making the market price and spot goods can be secured at $2.45 per 100 lb. In Southern markets supplies are heavier than in the North and $2.40 per 100 lb. is given as the trading basis. There has been no change in the schedule price for future shipments from Chile but interest is not keen at present in forward positions. Refined nitrate is quiet with prices at 4½@4¾c. per lb. for granulated and 5½@5¾c. per lb. for powdered.

Nitrite of Soda—Imported nitrite held a weak position and the recent reduction to 7¾c. per lb. for spot goods still held good with the market barely steady at that figure. Domestic goods also were said to be available at the 7¾c. level but 8c. per lb. was generally held as the asking price.

Prussiate of Soda—Sentiment was bearish and prices moved accordingly. The trend of value has been steadily downward and it appears as though a market is sought for imported irrespective of price. Prices for spot material were as low as 14¾c. per lb. and the lowering of prices failed to bring out any appreciable gain in buying. For shipment over the last half of the year, there were sellers at 14½c. per lb. but this price also failed to attract orders.

Miscellaneous Chemicals

Arsenic—Feeling that demand will improve appears to have gained ground but there was no marked improvement last week and prices remain irregular. Domestic producers quote prompt shipment at 13½c. per lb., but this has no bearing on the spot market as the domestic output is passing direct to consumers. In the spot market, however, it was possible to find sellers at 13½c. per lb., and from that level up to 14½c. per lb. is asked. On shipments over the last half of the year domestic producers quote 11c. per lb. Japanese grades are offered at 11½@11¾c. per lb. and European makes at 10¾c. per lb. Import figures show that 1,476,066 lb. of arsenic came in during April as compared with none in April last year.

Calcium Arensate—The market is in a waiting position. So far demand has not materially improved. Unsold stocks are large and it is a question whether buying or selling will set in first. Prices are quoted around 16c. per lb., but on firm business this might be shaded.

Copper Sulphate—Distressed imported material has been disposed of and the market presented a slightly firmer appearance on spot goods. Early in the week some business went through at 4½c. per lb., but later bids at this figure were turned down. Asking prices on foreign goods on spot settled at 4¾@5c. per lb. Imported sulphate for shipment was nominal at 4½c. per lb. Domestic producers reported the market as unchanged. Large crystals settled at 5.75c. per lb., with the small crystals at 5.65c. per lb., carload basis.

Pyridine—Cables from abroad were higher and with little on spot prices at the close were strong. Importers refused to quote less than $4 per gal., in drums, forward delivery.

Metal Salts—The market for tin was easier, but not so as to bring out a lower trading level in tin oxide. Leading factors held out for 48c. per lb. Tin crystals were unchanged at 34½c. per lb. Nickel sales were inactive, but with no change in the metal situation prices were repeated on the basis of 11½c. for the single. Imported copper oxide was steady at 20@21c. per lb., with inquiry fair.

Barium Chloride—Offerings in some directions were freer and this brought out an easier feeling in the market. However, prices are considered low and no real pressure developed. On carload business it was possible to do $80 per ton, prompt shipment. On less than carload lots $83 represented the market.

Sal Ammoniac—There was some question about quality on some of the goods offered during the past week or so, and several traders were not disposed to follow in marking prices downward. Imported material did sell as low as 6c. on the recent break, but at the close last week operators were asking from 6½@6¾c. per lb. on standard goods.

Alcohol

Several small shipments of denatured alcohol arrived here from the West Indies. The market was a steady affair so far as the domestic producers were concerned, demand being satisfactory, especially in the special grades. Formula No. 1, special, held at 35c. per gal., in drums, and 41c. per gal., in barrels. The completely denatured, formula No. 1, was offered by leading interests at 43c. per gal., in drums. Ethyl spirits, U.S.P., 190 proof, was nominally unchanged at $4.70 per gal., in barrels. Butyl alcohol, in drums, f.o.b. works, held at 26@27c. per gal. Production of methanol in April amounted to 738,059 gal., which compares with 831,784 gal. in March. The market was unchanged but steady at $1.18@$1.20 per gal., the price depending upon the grade.

Higher Prices for Potash

A Reuter's despatch from Berlin states that the Reich Potash Council has decided to increase the prices of potash by 45.72 per cent as from June 1.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	177.88
Last week	178.17
June, 1918	272.00
June, 1919	229.00
June 1920	274.00
June, 1921	147.00
June, 1922	157.00

An easier feeling prevailed and the decline in spot linseed oil was a factor in lowering the index number 29 points.

Coal-Tar Products

Phenol on Spot Offered Down to 42c.—Naphthalene Unsettled—Benzene Moving Slowly—Salicylates Quiet

PRODUCERS reported no price revisions, but second-hands offered spot material in a more liberal way and in order to move goods were disposed to meet the views of prospective buyers. The volume of business placed last week was disappointing. In the case of phenol the talk of increased production has restricted buying to a minimum. Actual offerings were not large, either for prompt or nearby shipment, but lack of buying interest again forced prices to lower levels and resale parcels could have been picked up at 42c. per lb. Leading producers, on the other hand, were not anxious sellers of nearby material. Cresylic acid was available on spot at slight concessions. The benzene situation was not considered favorable from the producers' standpoint, due chiefly to the low position of gasoline, but first-hands saw no reason for forcing sales, believing that the motor fuel market should improve from now on. Inquiry was reported for pure xylol. A small shipment of this commodity arrived here last week from abroad. Naphthalene demand showed moderate improvement, but offerings were plentiful and prices continued rather easy. Salicylates were unchanged.

Alpha-Naphthol—Prices named covered a wide range, depending upon the make. But actual trading was along routine lines and some selling pressure in outside channels unsettled the market. On the crude prices ranged from 60@70c. per lb.

Aniline Oil—Offerings were freer, but leading interests continued to quote on the basis of 16c. per lb., prompt shipment from works. On forward business it was possible to do slightly better, where round-lots were concerned.

Aniline Salt—Most traders held out for 23c. per lb., prompt shipment. This price was not firm, and scattered lots were available at concessions.

Benzoic Acid—A moderate inquiry was in evidence for the U.S.P. grade and prices steadied. For spot material asking price ranged from 77@80c. per lb. On forward business 72c. was the nominal quotation. The technical held at 70c. per lb. Offerings were light.

Benzaldehyde — Leading producers continued to quote the market steady at 75c. per lb. The stocks on hand were considered light, which offset temporary quietness in trading. The customary premium obtained on the U.S.P. grade.

Benzene—Offerings of the 90 per cent grade were plentiful, and with business anything but brisk, prices in some quarters presented an easier feeling. Leading interests, however, continued to quote on the basis of 25c. per gal., tanks, f.o.b works. The pure, in tanks, for prompt shipment, closed at 27c. per gal.

Cresylic Acid—Several small shipments arrived from English ports. There was no buying interest in the imported material for shipment from the other side. Scattered lots of spot goods could have been picked up below the prevailing cost of import. The 97 per cent sold down to $1.10 per gal. In general traders held out for $1.15. The lower grade was nominal at $1.05@$1.10 per gal.

Naphthalene—Moderate improvement was reported in flakes for immediate delivery, but with offerings fairly large, the market failed to steady. In fact it was possible to pick up scattered lots at concessions. During the week business went through at 8@8¼c. per lb. The market for the crude was neglected and on English material for shipment offerings at 3@3¼c. per lb., c.i.f., attracted little or no attention. On continental crude there were sellers around 2¼c. per lb., c.i.f. basis.

Paranitraniline — While the market settled at 70@75c. asked, as to make, scattered lots of spot goods did sell down to 68c. per lb. The demand was slow all week.

Phenol—The market was inactive and prices for spot material in outside channels were considered little more than nominal. Some traders continued to quote around 50c. per lb. on the U.S.P. grade, but admitted that better could have been done in other directions. Several parcels of resale material were around at 42c. per lb., a new low for the movement. Buyers were disposed to operate in a hand-to-mouth way only, believing that enough new production will come out by this fall to put the market on a fairly normal trading basis. Leading interests would not name a flat price on nearby material, but intimated that business might be acceptable around 30c. per lb.

Salicylic Acid—The demand was inactive, but no further price revisions were named by producers. Quotations settled nominally at 40@45c. per lb. on the U.S.P. grade.

Solvent Naphtha—A firm undertone featured the market as the supply was inadequate and producers could not see their way clear to bring out larger supplies in view of the peculiar marketing conditions in coal-tar crudes. The water-white held around 27@32c. per gal., tank car basis, f.o.b. works.

Xylene—Some buying interest was reported in the pure material, but with offerings scanty, the market for spot goods was wholly nominal, ranging from 95c.@$1 per gal. On contract 75c. could have been done.

Financial Notes

Merck & Co. have declared a dividend of $2 per share on the preferred stock of the company, payable July 2 to holders of record June 16. This is the first dividend on the issue since July 1, 1921.

The Tennessee Copper & Chemical Corp. has declared a regular quarterly dividend of $25 a share, payable July 16 to stock of record June 30.

The Dominion Textile Co., Ltd., of Montreal, has declared the regular quarterly dividend of 1¾ per cent on preferred stock and $1 per share on common stock. Three months ago a dividend of 3 per cent was declared on the common stock.

The Vulcan Detinning Co. reports for the quarter ended March 31 last net profit of $67,705, after charges and taxes, against $21,442 in the first quarter of last year. Sales amounted to $544,143, against $308,460, and expenses $435,226, against $291,433.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	65	65
Allied Chem. & Dye	71	69½
Allied Chem. & Dye pfd	109½	109½
Am. Ag. Chem.	18⅞	16½
Am. Ag. Chem. pfd	45	43½
American Cotton Oil	8	7⅞
American Cotton Oil pfd	17	•16
Am. Drug Synd.	5¼	5½
Am. Linseed Co.	25	22½
Am. Linseed pfd	47	43
Am. Smelting & Refining	62	62½
Am. Smelting & Refining pfd.	97½	97½
Archer-Daniels Mid. Co., w.i.	33½	33
Atlas Powder	170	170
Atlas Powder pfd.	•90	87½
Casein Co. of Am.	•60	•60
Certain-Teed Products	38	•38
Commercial Solvents	28	30
Corn Products	132½	131½
Corn Products pfd.	118	116½
Davison Chem.	30	29¾
Dow Chem. Co.	46	•42
Du Pont de Nemours	128	121⅜
Du Pont de Nemours db.	87½	85⅜
Freeport-Texas Sulphur	13⅞	13⅜
Glidden Co.	8	7½
Grasselli Chem.	133	133
Grasselli Chem. pfd	104½	105
Hercules Powder	105	103
Hercules Powder pfd	105	103
Heyden Chem.	1⅞	2½
Int'l Ag. Chem. Co.	4⅜	4½
Int'l Ag. Chem. Co. pfd	15⅞	14
Int'l Nickel	15	14½
Int'l Nickel pfd	80½	84⅜
Int'l Salt	•90	•90
Mathieson Alkali	49	47
Merck & Co.	87	•87
National Lead	123½	119
National Lead pfd	112	112
New Jersey Zinc	162	157
Parke, Davis & Co.	77½	78
Pennsylvania Salt	88	85
Procter & Gamble	•140	•130
Sherwin-Williams	•29	29
Sherwin-Williams pfd	•101	•102
Tenn. Copper & Chem.	•9⅜	9⅜
Texas Gulf Sulphur	60¼	59½
Union Carbide	59⅜	56⅜
United Drug	81⅜	80½
U. S. Industrial Alcohol	56¼	54½
U. S. Industrial Alcohol pfd.	98	•102
Va.-Car. Chem. Co.	10	9⅜
Va.-Car. Chem. pfd.	27⅜	26

•Nominal. Other quotations based on last sale.

Vegetable Oils and Fats

New Crop Cottonseed at 7c. f.o.b. Mills—Spot Linseed Lower—Palm Oils Decline—Soya Easier on Coast

PURCHASING AGENTS took the stand that the outlook favored buyers and with new crop developments in cotton and flaxseed gaining in importance as market factors operations during the week were held down to a minimum. Some speculative transactions in new crop cottonseed oil took place, but these did not assume large proportions and most traders were inclined to fight shy of this class of business. Spot linseed was easier on reports that several crushers have caught up on deliveries.

Cottonseed Oil—Trading in cottonseed oil options on the Produce Exchange was inactive. Early last week the July option firmed up on covering by shorts, but as soon as this demand was satisfied prices eased off. In futures the undertone was rather easy because of the uncertainty surrounding the new crop. The season is 2 weeks late throughout the South and reports on the new crop were not exactly encouraging. Private preliminary estimates on cotton production range all the way from 11,000,000 to 12,000,000 bales, a rather wide difference of opinion. Business in refined oil was moderate only, but with a tight statistical situation on old crop oil bears were inclined to go slow. Live hogs were unsettled on liberal receipts and Chicago reported the market at \$6.85@\$7.05 per 100 lb. Cash lard in Chicago held around 11.20c. per lb. In the opinion of some traders cheap hogs and lard tend to offset the bullish statistics on cottonseed oil. Trading in old crop crude cottonseed oil was limited because of the scanty supply and the market settled at 10c. per lb., buyers' tanks, f.o.b. mills. Transactions in new crop crude of a speculative character were few and far between, but some business did go through at 7c. per lb., f.o.b. Texas points, November-December-January shipment. New crop October oil was offered at 8¼@8½c. per lb., f.o.b. mills, Texas. Bleachable for prompt shipment from the South was nominally unchanged at 10½c. per lb., buyers' tanks, f.o.b. mills. Lard compound in New York held at 13@13½c. per lb., carload basis.

Linseed Oil—Several crushers were in a position to quote on prompt carload business and this resulted in lower prices for nearby oil. On futures, however, the market appeared to be a little firmer as crushers were not disposed to force the market until a better survey of the world's seed situation is possible. The crop outlook in the Northwest is regarded as favorable and according to reports received here late last week seeding in North Dakota is still in progress. One operator went so far as to predict that the acreage figures, when available, will make the best showing in several years. Where the new crop is above ground the condition is said to be good. Argentine shipments continue at a liberal rate, but covering last week by July shorts revealed that the supplies must be in pretty firm hands. Indian offerings are being absorbed by the United Kingdom. Demand for linseed oil during the week was moderate only. Distressed foreign oil on spot was purchased by a crusher and this steadied the imported commodity. Domestic oil sold for prompt shipment at \$1.10 per gal., cooperage basis. July was offered at \$1.06 per gal., with August forward at \$1.03 per gal. Linseed cake for export was quiet, but quotably unchanged at \$34 per ton.

China Wood Oil—The market was quiet and prices at the close were barely steady. July shipment oil was offered at 26c. per lb., in bbl., carload lots, with futures available at 22@23c. per lb. There was no buying interest in futures.

Coconut Oil—One tank car of Ceylon type oil sold for prompt shipment at 8¼c. per lb. On the coast the market held at 8@8¼c. per lb. for Ceylon type oil, sellers' tanks, prompt and forward shipment. Demand was dull. Copra was nominally unchanged at 4⅝c. asked, Manila sun dried, c.i.f. coast ports.

Olive Oil Foots—Several parcels were pressing on the market all week and this imparted an easy feeling and held prices down. There were sellers of prime green foots on spot at 8c. per lb. On futures the market settled at 8⅛@8¼c. per lb., c.i.f. New York.

Palm Oils—Importations were heavy, but most of the oil went directly to soapers. New business was inactive, due in part to the low position of tallow. Resale material on spot sold at 7c. on the Lagos grade, and at 6¾c. on Niger. Lagos for shipment was nominal at 7¼c. per lb., while Niger for forward delivery settled at 6¾@7c. per lb.

Sesame Oil—There was a little trading in spot at 11⅞@12c. per lb. Refined oil for shipment was offered down to 11c. per lb., c.i.f. New York.

Soya Bean Oil—There were sellers of crude for future shipment from the Pacific coast at 9⅝c. per lb., sellers' tanks, duty paid. One car of spot oil sold at 10c. per lb., f.o.b. New York. Several large shipments are about due here, which tends to unsettle the market.

Fish Oils—Crude menhaden oil was quiet at 50c. asked. Reports on the fishing operations along the Atlantic coast were unfavorable. Some traders look for a "lean" year. Newfoundland cod oil was offered in a small way and prices held at 70@72c. per gal.

Tallow and Greases—Extra special tallow closed at 7⅛c. bid, with the market for outside goods equal to extra at 7⅜c. sales. The undertone was a shade firmer. Yellow grease sold at 6c. per lb., Chicago. Oleo stearine was offered at 9c. per lb., carload lots, New York.

Miscellaneous Materials

Glycerine—The market for c.p. glycerine on spot was unsettled, but most refiners continued to quote on the basis of 17c. per lb., in drums, carload lots. Trading was inactive and this resulted in freer offerings from factors not so bullish on the general situation. In some directions c.p. glycerine might have been picked up around 16½c. per lb. In the middle-west dynamite was offered at 15½c. per lb., in drums, carload basis. No sales were reported in New York territory and prices at the close were nominal. Soaplye crude, basis 80 per cent, sold in the middle-west at 10½c. per lb., loose. Saponification, basis 88 per cent, held at 11½c. in the middle-west, while in New York 12c. was asked, carload lots, loose.

Naval Stores—The market advanced early in the week on a showing of business, but as soon as the inquiry fell away prices eased off. At one time scattered business in turpentine went through as high as \$1.10 per gal. Just before the close there were offerings at \$1.06 per gal., with the undertone easy. Receipts in the South were considered liberal. Export demand was slow. In rosins not much business came to light and prices went off from 10@15c. per bbl. The lower grades closed nominally at \$5.80 per bbl.

Shellac—The market was a shade firmer, on higher cables from Calcutta, but not much business developed. The arrivals were heavy and this brought out some ex-dock selling at concessions. Nominally the market for T.N. settled at 59c. per lb., with the superfine orange at 64c. per lb., and bleached bonedry at 72c. per lb.

Varnish Gums—The past week witnessed heavy importations of copals. Several shipments of damar also were noted. The spot offerings were liberal and it was possible to pick up supplies at concessions from the prevailing cost of import. Batavian damar settled at 27⅞@28¼c. per lb. Demand was routine.

White Lead, Etc.—Leading producers of white lead announced late last week that the guarantee against decline provisions in the sales contract would b extended until November 30. This new gave traders more confidence in the market and business held up well in all directions. Standard dry white lead held at 9¾c. per lb., in casks.

Zinc Oxide—The easier market for the metal had little or no influence upon prices for oxide. Producers appear to be well sold up and the old price schedule was maintained in all directions. American process, lead free, was traded in on the basis of 8c. per lb. French process, red seal, held at 9¾c. per lb.

London Tallow Auction

At the regular auction of tallow, held in London June 13, the offerings consisted of 1,685 casks. Sales amounted to 1,283 casks and prices realized were unchanged to 6 pence higher.

Imports at the Port of New York

June 8 to June 14

ACIDS—940 bbl. tartaric, Grieste, Order; 650 bbl. tartaric, Trieste, Order; 53 dr. cresylic, Liverpool, W. E. Jordan & Bro.; 62 dr. cresylic, Liverpool, Order; 40 keg tartaric, London, Order; 100 csk. citric, Palermo, R. F. Downing & Co.; 400 csk. citric, Palermo, W. Neuberg; 100 csk. citric, Palermo, Order.

ALIZARINE—13 csk., Liverpool, A. Klipstein & Co.

ALCOHOL—50 bbl. denatured, Arecibo, M. Feigel Bros.; 55 bbl. do, Arecibo, C. Estevas; 52 csk. butyl, Bordeaux, Commercial Solvents Corp.; 55 bbl. denatured, Arecibo, G. Esteva.

ANTHRACENE—211 pkg. crude, Manchester, Order.

ANILINE OIL—3 bbl. Barcelona, Order.

ANTIMONY OXIDE—200 bg. Shanghai, Rare Metals Products Co.

AMMONIUM—60 csk. perchlorate, Marseilles, Order; 15 csk. carbonate, Liverpool, J. Turner & Co.; 25 pkg. do, Liverpool, Brown Bros. & Co.; 20 keg persulphate, Liverpool, J. Turner & Co.; 720 csk. nitrate, Hamburg, Kuttroff, Pickhardt & Co.

ARSENIC—87 csk., Antwerp, Order; 150 cs., Rotterdam, Lundham & Moore; 101 bbl., Tampico, Am. Metal Co.; 33 dr. and 20 csk., London, C. Tennant Sons & Co.; 200 csk., Hamburg, Ore & Chemical Corp.; 100 csk., Hamburg, A. J. Marcus; 100 bbl. arsenic, Tampico, Order.

ASBESTOS—701 bg., Southampton, W. D. Crumpton & Co.

BARYTES—300 bg., Bremen, New York Trust Co.; 300 bg. and 100 csk., Bremen, Order.

BRONZE POWDER — 14 cs., Bremen, B. F. Drakenfeld & Co.; 22 cs., Hamburg, H. Pietzsch.

CALCIUM CHLORIDE—322 dr., Hamburg, Irving Bank-Col. Trust Co.

CASEIN—256 sk., Bordeaux, National City Bank; 532 sk., Bordeaux, Martin Cantine; 100 sk., Bordeaux, Order; 200 bg., Hamburg, Order; 88 bg., Hamburg, Order; 100 bg., Havre, Monite Waterproof Glue Co.; 174 bg., Hamburg, A. Klipstein & Co.; 667 bg., Buenos Aires, Equitable Trust Co.; 1,167 bg. Buenos Aires, Order; 350 sk., Auckland, Asia Banking Corp.; 630 sk., Wellington, Bankers' Trust Co.; 417 bg., Buenos Aires, Irving Bank-Col. Trust Co.

CHALK—450 bg., Antwerp, Irving Bank-Col. Trust Co.; 200 bbl., Antwerp, Bankers' Trust Co.; 500,000 kilos, Dunkirk, J. W. Higman & Co.

CHEMICALS — 230 csk., Bremen, W. Schall & Co.; 18 csk., Bremen, Order; 270 csk., Rotterdam, Order; 18 cs., Hamburg, National Am. Bank; 50 bbl., Hamburg, Roessler & Hasslacher Chem. Co.; 249 pkg., Bremen, Roessler & Hasslacher Chem. Co.

COPPER SULPHATE—100 csk., Hamburg, A. J. Marcus; 74 csk., Liverpool, Order; 91 cs., London, Ore & Chemical Corp.

COPPER OXIDE—50 dr., Hamburg, Am. Metal Co.

COLORS — 32 csk. umber, Hull, L. H. Butcher & Co.; 215 sk. do, Hull, H. A. Robinson & Co.; 50 csk. dry, Hull, J. Lee Smith & Co.; 27 csk., Hamburg, Kuttroff, Pickhardt & Co.; 11 csk., Hamburg, H. A. Metz & Co.; 7 csk., Hamburg, E. C. Foster; 11 csk. dry, Hamburg, Palm Bros. & Co.; 2 csk. aniline, Rotterdam, L. & R. Organic Products Co.; 34 csk. earth, Rotterdam, C. J. Osborn & Co.; 17 csk. do, Rotterdam, Reichard-Coulston, Inc.; 2 csk. aniline, Liverpool, Irving Bank-Col. Trust Co.; 91 csk. coal-tar colors, Hamburg, Order.

COPRA—32 bg., San Andreas, Franklin Baker Co.

CREAM TARTAR—50 csk., Bordeaux, R. W. Greeff & Co.; 25 csk., Bordeaux, Order; 100 csk., Marseilles, Brown Bros. & Co.

DYES—3 bbl. aniline, Danzig, Organic Products Co.; 2 cs. aniline, Hamburg, Franklin Imp. & Exp. Co.; 3 csk., Rotterdam, Bank of Manhattan Co.; 4 cs. aniline, Hamburg Carbic Color & Chemical Co.

DIVI-DIVI—540 bg., Pampatar, Eggers & Heinlein; 225 bg., Pampatar, Goldsmith & Co.; 656 bg., Curacao, Ultramares Corp.

EPSOM SALT — 1,000 bg., Bremen, E. Suter & Co.

FERRIC OXIDE — 152 bbl., Hamburg, Order.

FLUORSPAR—170 tons, Cape Town, Order.

FUSEL OIL—35 bbl., Trieste, Continental Shipping Co.; 14 bbl., Dunkirk, Eastman Kodak Co.; 29 dr., Hamburg, Order.

GALLNUTS—400 cs., Hankow, Mallinckrodt Chem. Works; 500 cs., Souraboya, J. D. Lewis.

GAMBIER—161 bg., Singapore, Order.

GUMS—580 bg. copal, Antwerp, Order; 384 bg. damar and 128 bg. copal, Singapore, Chemical National Bank; 280 bg. damar and 140 bg. copal, Singapore, L. C. Gillespie & Sons; 464 bg. copal, Singapore, Order; 1,430 bg. copal, Antwerp, Central Union Trust Co.; 640 bg. copal, Antwerp, Chemical National Bank; 965 bg. copal, Antwerp, Order; 15 cs. tragacanth, Southampton, Order; 60 pkg. tragacanth, London, Brown Bros. & Co.; 14 cs. do., London, Gullabi Gulbenkian & Co.; 250 pkg. arabic, London, Order; 937 bg. arabic, Port Sudan, Brown Bros. & Co.; 1,275 bg. do., Port Sudan, Order; 1,560 sks. copal, Matadi, L. C. Gillespie & Sons; 3,198 sk. and 455 pkg., Matadi, Niger Co.; 385 bg. copal, 100 cs. do. and 350 bg. damar, Singapore, Baring Bros. & Co.; 140 bg. damar, Singapore, Standard Bank of So. Africa; 175 bg. copal, Singapore, Irving Bank; 240 bg. copal and 350 bg. damar, Singapore, L. C. Gillespie & Sons; 70 bg. copal, Singapore, Chem. Nat'l Bank; 140 bg. damar and 214 bskt. copal, Singapore, Kidder, Peabody & Co.; 350 cs. damar, Singapore, Order.

GLYCERINE—25 dr., Marseilles, Brown Bros. & Co.; 90 dr., Marseilles, Order.

GLAUBER SALT—111 csk., Hamburg, E. M. Sergeant Co.

IRON OXIDE—38 csk., Hull, J. Lee Smith & Co.; 65 bbl., Malaga, National City Bank; 228 bbl., Malaga, C. J. Osborn & Co.; 200 bbl., Malaga, Am. Exchange Nat'l Bank; 18 bbl., Malaga, F. B. Vandegrift & Co.; 33 bbl., Malaga, L. H. Butcher & Co.; 56 bbl., Malaga, E. M. & F. Waldo; 31 bbl., Malaga, J. Lee Smith & Co.; 25 csk., Liverpool, R. J. Waddell & Co.; 45 csk., Liverpool, J. A. McNulty; 53 csk., Liverpool, L. N. Butcher & Co.

LITHOPONE—600 csk., Antwerp, B. Moore & Co.; 200 csk., Hamburg, A. Klipstein & Co.

LOGWOOD CRYSTALS — 12 bbl., Cape Haitian, Logwood Mfg. Co.

LOGWOOD EXTRACT—77 bbl., Cape Haitian, Logwood Mfg. Co.

MAGNESITE—313 bg., Rotterdam, Speiden-Whitfield Co.

MAGNESIUM—22 csk. sulphate, Manchester, Order; 528 dr. chloride, Hamburg, Innis, Speiden & Co.; 145 dr. do., Hamburg, A. Kramer & Co.; 113 bg. carbonate, Glasgow, E. M. Sergeant & Co.

MANGROVE BARK—2,600 pkg., Singapore, Order.

MYROBALANS — 2,600 pkt., Calcutta, National City Bank; 10,140 pkt., Calcutta, Standard Bank of South Africa; 12,000 pkt., Calcutta, Order.

NAPHTHALENE—663 bg., Antwerp, Order; 1,000 bg., London, Order; 1,416 bg., Rotterdam, Lunham & Moore.

OCHER—150 csk., Bordeaux, Order; 387 csk., Marseilles, American Exchange Nat'l Bank; 100 csk., Marseilles, J. Lee Smith & Co.; 91 cs., Marseilles, L. H. Butcher & Co.; 90 csk., Marseilles, F. B. Vandegrift & Co.; 46 bbl., Alicante, Hummel & Robinson.

OILS—Castor—105 bbl., Hull, Order. **China Wood**—330 bbl., London, Order; 30 bbl., Liverpool, Royal Bank of Canada; 108 bbl., London, Royal Bank of Canada; 150 bbl., London, Bank of America. **Cod**—120 bbl., Hull, I. R. Boody & Co.; 450 bbl., Hull, Order; 38 bbl., Antwerp, Order. **Fish**—100 bbl., Hull, I. R. Boody & Co. **Linseed**—300 bbl., Hull, Baring Bros. & Co.; 500 bbl., Hull, Order; 817 tons (bulk), Antwerp, Order; 301 bbl., Antwerp, Order; 603 tons (bulk), Hull, Am. Linseed Co.; 30 bbl., Rotterdam, W. Benkert & Co.; 289 dr., Rotterdam, Order; 329 bbl., Manchester, Order. **Olive Oil** (denatured)—25 bbl., Marseilles, Order. **Olive Oil Foots**—200 bbl., Naples, Brown Bros. & Co.; 150 bbl., Naples, Banca Comm. Ital.; 600 bbl., Seville, J. B. Dewsnap. & Co. **Palm**—720 csk., Opobo, Niger Co.; 400 csk., Abonama, Irving Bank-Col. Trust Co.; 160 csk., Port Harcourt, Thornett & Fehr; 280 csk., Port Harcourt, Niger Co.; 80 csk., Port Harcourt, Order; 735 csk., Warri, African & Eastern Trading Corp.; 406 csk., Warri, J. Holt & Co.; 163 csk., Warri, W. & A. Leaman; 323 csk., Lagos, Grace & Co.; 193 csk., Lagos, Irving Bank-Col. Trust Co.; 316 csk., Lagos, Niger Co.; 34 csk., Iddo, Niger Co.; 200 csk., Iddo, Order; 74 csk., Rotterdam, African & Eastern Trading Co.; 32 csk., Rotterdam, Order; 34 pipes, 14 tcs. and 211 bbl., Loanda Sousa, Machado & Co.; 3,252 csk., Matadi, Niger Co.; 62 csk., Cotonou, Irving Bank-Col. Trust Co.; 53 csk., Cotonou, Order. **Rapeseed**—150 bbl., Hull, Hudson Oil Co.; 175 bbl., Hull, Nat'l City Bank; 200 bbl., Hull, Balfour, Williamson & Co.; 550 bbl., Hull, Order. **Sesame**—147 bbl., Rotterdam, Nat'l City Bank; 293 bbl., Rotterdam, Order.

OIL SEEDS—Castor—104 bg., Port de Paix, Huttlinger & Struller; 39 bg., Port de Paix, H. Mann & Co.; 2,000 bg., Pernambuco, Central Union Trust Co.; 2,000 bg., Pernambuco, Baker Castor Oil Co. **Linseed**—131,122 bg., Buenos Aires, Spencer Kellogg & Sons.

OPIUM—12 cs., Constantinople, Order.

POTASSIUM SALTS—15 csk. carbonate, Bremen, P. H. Petry & Co.; 1,000 bg. sulphate and 1,000 bg. muriate, Bremen, Potash Importing Corp. of America; 30 dr. permanganate, Hamburg, Pfaltz & Bauer; 1,000 bbl. chlorate, Hamburg, Order; 3,000 bg. muriate, Hamburg, Order; 3,646 bg. manure salt, Hamburg, Potash Importing Corp. of America; 500 bbl. chlorate, Marseilles, Asia Banking Corp.; 375 csk. chlorate, Marseilles, Order; 300 csk. perchlorate, Marseilles, Order; 50 dr. permanganate, Hamburg, Du Dont de Nemours & Co.; 236 csk. carbonate, Hamburg, Order; 2 dr. permanganate, Hamburg, Order; 5,500 bg. manure salt and 1 lot do., Hamburg, Order; 65 cs. caustic, Gothenburg, Merck & Co.

QUICKSILVER—26 flasks, Tampico, J. Elizondo; 30 flasks, Seville, C. L. Huisking, Inc.; 250 flasks, Seville, Du Pont de Nemours & Co.

QUEBRACHO—17,800 bg. extract, Buenos Aires, Tannin Corp.; 4,206 bg., Buenos Aires, Beekman, Winthrop & Chartman.

SAL AMMONIAC—88 csk., Hamburg, Philipp Bauer Co.; 44 csk., Hamburg, Innis, Speiden & Co.

SHELLAC—50 bg. garnet lac, Hamburg, Irving Bank-Col. Trust Co.; 205 cs. stick lac, Bangkok, Order; 163 csk. stick lac, Marseilles, Order; 300 bg., Calcutta, Chase National Bank; 332 bg., Calcutta, National City Bank; 1,225 bg. refuse, Calcutta, Bank of the Manhattan Co.; 100 bg., Calcutta, London & Liverpool Bank of Comm.; 25 bg., Calcutta, Bank of America; 50 bg., Calcutta, Mechanics & Metals National Bank; 50 bg., Calcutta, Standard Bank of South Africa; 1,358 bg., Calcutta, Order; 112 cs., Calcutta, Order; 600 bg., Calcutta, First Nat'l Bank of Boston; 250 bg., Calcutta, Mech. & Metals Nat'l Bank; 200 bg., Calcutta, Br. Bank of So. Am.; 871 bg., Calcutta, Order; 30 bg., Hamburg, Kasebier-Chatfield Shellac Co.

SODIUM SALTS—300 bg. chlorate, Hamburg, Order; 110 bg. fluosilicate, Hamburg, Order; 49 cs. chlorate, Venice, Order; 112 cs. cyanide, Marseilles, National City Bank; 120 csk. hyposulphite, Marseilles, Order; 190 dr. caustic, Hamburg, A. Klipstein & Co.; 223 dr. sulphide, Hamburg, Order; 49 csk. fluoride, Hamburg, Order; 25 bbl. bicarbonate, Hamburg, K. A. Blank.

SUMAC—10 bg., Glasgow, American Dyewood Co.

TALLOW—500 pkg. vegetable, Hankow, American Linseed Co.; 190 tcs. beef, Vancouver, Van Iderstine Co.; 299 tcs. beef, Rio Grande do Sul, Swift & Co.

TANNING EXTRACT—700 bg., Beira, Cooper & Cooper.

TARTAR—39 csk., Naples, Tartar Chemical Works; 9 csk., Naples, C. B. Richard & Co., 578 sks., Marseilles, Tartar Chemical Co.; 110 pkg., Marseilles, C. Pfizer & Co.; 351 sk., Alicante, C. Pfizer & Co.

WAXES—600 bg. montan, Bremen, Order; 128 bg. bees, Antwerp, Order; 5 bg. bees, Santiago, Order; 79 bg. bees, Rio de Janeiro, London & Brazilian Bank; 150 bg. do., Rio de Janeiro; American Trading Co.

WOOL GREASE—100 bbl., Hull, Marden Wild Corp.

WHITING—1,000 bg., Antwerp, Bankers' Trust Co.

XYLENE—5 dr., London, Van Oppen & Co.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetic anhydride, 85%, drums	lb.	$0.38 –	....
Acetone, drums	lb.	.25 –	.25½
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.50
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.50
Boric, bbl.	lb.	.10½–	
Citric, kegs	lb.	.49 –	.52
Formic, 85%	lb.	.14 –	.16
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.11½–	.12
22% tech., light, bbl.	lb.	.05½–	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks,	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½–	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.13 –	.13½
Phosphoric, 50% carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.50 –	11.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	16.00 –	16.50
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.35½–	.36
Tartaric, domestic, bbl.	lb.	.37½–	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.75 –	4.95
Ethyl, 190p'f, U.S.P., bbl.	gal.	4.70 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.41 –	...
No. 1, 190 proof, special, dr.	gal.	.35 –	...
No. 1, 188 proof, bbl	gal.	.42 –	...
No. 1, 188 proof, dr	gal.	.36 –	...
No. 5, 188 proof, bbl.	gal.	.40 –	...
No. 5, 188 proof, dr	gal.	.34 –	...
Alum, ammonia, lump, bbl.	lb.	.03½–	.03¾
Potash, lump, bbl.	lb.	.02½–	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.05¾
Aluminum sulphate, com., bags	100 lb.	1.50 –	1.65
Iron free bags	lb.	.02½–	.02¾
Aqua ammonia, 26°, drums	lb.	.06½–	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½–	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	3.50 –	3.75
Arsenic, white, powd., bbl.	lb.	.13½–	.14
Arsenic, red, powd., kegs	lb.	.15½–	.16
Barium carbonate, bbl.	ton	70.00 –	75.00
Barium chloride, bbl.	ton	80.00 –	83.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks	....	.08 –	.08½
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 –	....
Spot N. Y. drums	100 lb.	2.40 –	....
Borax, bbl.	lb.	.05½–	.05¾
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.16 –	.16½
Calcium carbide, drums	lb.	.05½–	.05¾
Calcium chloride, fused, drums	ton	22.00 –	23.00
Gran. drums	ton	28.00 –	30.00
Calcium phosphate, mono, bbl.	lb.	.06½–	.07
Camphor, cases	lb.	.86 –	.88
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	.09½–	.10
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04¾
Domestic, heavy, bbl.	lb.	.03½–	.03¾
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.05½–	.05¾
Cylinders, 100 lb., wks	lb.	.06 –	.06½
Cylinders, 100 lb., spot	lb.	.09 –	....
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	20.00 –	21.00
Copper carbonate, bbl.	lb.	.19 –	.20
Copper cyanide, drums	lb.	.47 –	.50
Copper sulphate, dom., bbl.	100 lb.	5.75 –	....
Imp. bbl.	100 lb.	4.75 –	5.00
Cream of tartar, bbl.	lb.	.25½–	.26½
Epsom salt, dom., tech., bbl.	100 lb.	1.90 –	2.15
Epsom salt, imp., tech., bags	100 lb.	.90 –	1.00
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.50 –	2.60
Ether, U.S.P., resale, dr.	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.80 –	.81
Ethyl acetate, pure (acetic ether, 98% to 100%)	gal.	.95 –	1.00
Formaldehyde, 40%, bbl.	lb.	$0.14½–	$0.15
Fullers earth—imp., powd., net	ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	.... –	
Fusel oil, crude, drums	gal.	3.50 –	3.75
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.16½–	.17
Glycerine, dynamite, drums	lb.	.15½–	.16½
Glycerine, crude 80%, loose	lb	.10½–	.11
Iodine, resublimed	lb.	4.55 –	4.65
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½–	.10
White, basic sulphate, casks	lb.	.09½–	....
White, in oil, kegs	lb.	.12½–	.14
Red, dry, casks	lb.	.11½–	.12
Red, in oil, kegs	lb.	.13½–	.15
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13
Lead arsenate, powd., bbl.	lb.	.23 –	.24
Lime-Hydrated, bbl.	per ton	16.80 –	17.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½–	.11
Lithophone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07½–	.07¾
Magnesium carb., tech., bags	lb.	.08½–	.08¾
Methanol, 95%, bbl.	gal.	1.18 –	1.20
Methanol, 97%, bbl.	gal.	1.20 –	1.22
Nickel salt, double, bbl.	lb.	.10½–	....
Nickel salts, single, bbl.	lb.	.11½–	....
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	.... –	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.11½–	.11¾
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½–	.06¾
Potassium chlorate, powd.	lb.	.07½–	.08
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08½	.08¾
Potassium hydroxide (caustic potash) drums	lb.	.07½–	.09
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06½–	.07½
Potassium permanganate, drums	lb.	.17½–	.19
Potassium prussiate, red, casks	lb.	.65 –	.67
Potassium prussiate, yellow, casks	lb.	.31 –	.33
Salammoniac, white, gran., casks, imported	lb.	.06 –	.06½
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.60 –	1.67
Soda ash, light, basis, 48%, bags, contract, f.o.b. wks.	100 lb.	1.20 –	1.30
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.75 –	1.80
Soda ash, dense, bags, contract, basis 48%	100 lb.	1.17½–	1.20
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums, f.a.s.	100 lb.	3.20 –	3.30
Soda, caustic, basis 60%, wks., contract	100 lb.	2.50 –	2.60
Soda, caustic, ground and flake, contracts	100 lb.	3.80 –	3.90
Soda, caustic, ground and flake, resale	100 lb.	3.72½–	....
Sodium acetate, works, bags	lb.	.05½–	.06¼
Sodium bicarbonate, bbl.	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.08½–	.09
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04½
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.21 –	.23
Sodium fluoride, bbl.	lb.	$0.08½–	$0.10½
Sodium hyposulphite, bbl.	lb.	.02½–	.03
Sodium nitrite, casks	lb.	.07½–	.08½
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½–	.04
Sodium prussiate, yel. drums	lb.	.14½–	.16
Sodium salicylic, drums	lb.	.47 –	.52
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.04½–	.04½
Sodium sulphite, crys., bbl.	lb.	.03½–	.03¾
Strontium nitrate, powd., bbl.	lb.	.12½–	.13
Sulphur chloride, yel drums.	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Talc—imported, bags	ton	30.00 –	40.00
Talc—domestic powd., bags.	ton	18.00 –	25.00
Tin bichloride, bbl.	lb.	.12½–	.13
Tin oxide, bbl.	lb.	.48 –	....
Tin crystals, bbl.	lb.	.34½–	.35
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½–	.06¾
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½–	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½–	....
French, green seal, bags	lb.	.10½–	....
French, white seal, bbl.	lb.	.12 –	....
Zinc sulphate, bbl.	100 lb.	2.50 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.62 –	$0.75
Alpha-naphthol, ref., bbl.	lb.	.70 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.37
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.23 –	.24
Anthracene, 80%, imp., drums, duty paid	lb.	.75 –	1.00
Anthraquinone, 25%, paste, drums	lb.	.70 –	.75
Benzaldehyde U.S.P., carboys	lb.	1.40 –	1.45
tech, drums	lb	75	80
Benzene, pure, water-white, tanks and drums	gal.	.27 –	.32
Benzene, 90%, tanks & drums	gal.	.25 –	.30
Benzene, 90%, drums, resale	gal.	.28 –	.32
Benzidine base, bbl.	lb.	.80 –	.85
Benzidine sulphate, bbl.	lb.	.70 –	.75
Benzoic acid, U.S.P., kegs	lb.	.75 –	80
Benzoate of soda, U.S.P., bbl.	lb.	.57 –	.65
Benzyl chloride, 95-97%, ref., drums	lb.	.45 –	....
Benzyl chloride, tech., drums	lb.	.30 –	.35
Beta-naphthol, tech., bbl.	lb.	.21½–	.22½
Beta-naphthylamine, tech.	lb.	.80 –	.90
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, resale, drums	gal.	1.15 –	1.20
95-97%, drums, resale	gal.	1.10 –	....
Dichlorbenzene, drums	lb.	.07 –	.09
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.41 –	.42
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitroclorbenzenee bbl.	lb.	.22 –	.23
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluene, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.08 –	.08½
Naphthalene, balls, bbl.	lb.	.08½–	.09
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½–	.14½
N-W acid, bbl.	lb.	1.25 –	1.30
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.17 –	.20
Ortho-nitrophenol, bbl.	lb.	.90 –	.92
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.13 –	.14½
Para-amidophenol, base, kegs	lb.	1.20 –	1.30
Para-amidophenol, HCl, kegs	lb.	1.25 –	1.35
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitroaniline, bbl.	lb.	.70 –	.75
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.90 –	.95
Phthalic anhydride, bbl.	lb.	.35 –	.38
Phenol, U.S.P., resale, dr.	lb.	.42 –	.48
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	

Pyridine, imp., drums	gal.	$4.00 –	$4.25
Resorcinol, tech., kegs	lb.	1.50 –	1.60
Resorcinol, pure, kegs	lb.	2.25 –	
R-salt, bbl	lb.	.55 –	.60
Salicylic acid, tech., bbl	lb.	.37 –	.42
Salicylic acid, U.S.P., bbl	lb.	.40 –	.45
Solvent naphtha, water-white, drums	gal.	.27 –	.32
Crude, drums	gal.	.24 –	
Sulphanilic acid, crude, bbl	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Toluidine, kegs	lb.	1.20 –	1.30
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.35
Toluene, drums	gal.	.34 –	.36
Xylidines drums	lb.	.49 –	.50
Xylene, pure, drums	gal.	.75 –	1.00
Xylene, com., drums	gal.	.37 –	
Xylene, com., tanks	gal.	.32 –	

Naval Stores

Rosin B-D, bbl. 280 lb.		$5.80 –	
Rosin E-I, bbl. 280 lb.		5.90 –	
Rosin K-N, bbl. 280 lb.		6.10 –	
Rosin W.G.-W.W., bbl. 280 lb.		6.25 –	7.25
Wood rosin, bbl. 280 lb.		5.90 –	6.00
Turpentine, spirits of, bbl.	gal.	1.06 –	
Wood, steam dist., bbl.	gal.	.98 –	
Wood, dest. dist., bbl.	gal.	.68 –	
Pine tar pitch, bbl. 200 lb.		–	6.00
Tar, kiln burned, bbl. 500 lb.		–	13.00
Retort tar, bbl. 500 lb.		–	12.00
Rosin oil, first run, bbl.	gal.	.45 –	
Rosin oil, second run, bbl.	gal.	.48 –	
Rosin oil, third run, bbl.	gal.	.52 –	
Pine oil, steam dist.	gal.	.70 –	
Pine oil, pure, dest. dist.	gal.	.65 –	
Pine tar oil, ref.	gal.	.48 –	
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	–	.75
Pine tar, ref., thin, bbl.	gal.	–	.25
Pinewood creosote, ref., bbl.	gal.	–	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½ –	$0.04½
Grease, yellow, bbl.	lb.	.06½ –	
Lard oil, Extra No. 1, bbl.	gal.	.90 –	.92
Neatsfootoil, 20 deg. bbl.	gal.	1.30 –	
No. 1, bbl.	gal.	.92 –	.94
Oleo Stearine		.09 –	
Red oil, distilled, d.p. bbl.	lb.	.10½ –	.10½
Saponified, bbl.	lb.	.10½ –	.10½
Tallow, extra, loose	lb.	.07½ –	
Tallow oil, acidless, bbl.	gal.	.94 –	.96

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.14 –	
Castor oil, No. 1, bbl.	lb.	.14½ –	
Chinawood oil, bbl.	lb.	.28 –	
Coconut oil, Ceylon, bbl.	lb.	.09½ –	
Ceylon, tanks, N.Y.	lb.	.08½ –	.08½
Coconut oil, Cochin, bbl.	lb.	.09½ –	.10
Corn oil, crude, bbl.	lb.	.12½ –	
Crude, tanks, (f.o.b. mill)	lb.	.09½ –	
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.10 –	
Summer yellow, bbl.	lb.	.12½ –	.13
Winter yellow, bbl.	lb.	.13½ –	.13½
Linseed oil, raw, car lots, bbl.	gal.	1.10 –	
Raw, tank cars (dom.)	gal.	1.05 –	
Boiled, cars, bbl. (dom.)	gal.	1.12 –	
Olive oil, denatured, bbl.	gal.	1.10 –	
Sulphur, (foots) bbl.	lb.	.08 –	.08½
Palm, Lagos, casks	lb.	.07 –	
Niger, casks	lb.	.06½ –	
Palm kernel, bbl.	lb.	.08½ –	.08½
Peanut oil, crude, tanks (mill)	lb.	.12½ –	.13
Peanut oil, refined, bbl.	lb.	.16½ –	
Perilla, bbl	lb.	.15½ –	.16
Rapeseed oil, refined, bbl.	gal.	.83 –	.84
Rapeseed oil, blown, bbl.	gal.	.88 –	.89
Sesame, bbl.	lb.	.11½ –	.12
Soya bean (Manchurian), bbl.	lb.	.12½ –	
Tank, f.o.b. Pacific coast	lb.	.09½ –	.09½
Tank, (f.o.b. N.Y.)	lb.	.10 –	

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.70 –	$0.72
Menhaden, light pressed, bbl.	gal.	.76 –	
White bleached, bbl.	gal.	.78 –	
Blown, bbl.	gal.	.82 –	
Crude, tanks (f.o.b. factory)	gal.	.50 –	
Whale No. 1 crude, tanks, coast	lb.	–	
Winter, natural, bbl.	gal.	.76 –	.78
Winter, bleached, bbl.	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$26.00 –	$28.00
Copra, sun dried, bags, (c.i.f.)	lb.	.04½ –	.05
Sun dried Pacific coast	lb.	.04½ –	.04½
Cottonseed meal, f.o.b. mills	ton	36.00 –	
Linseed cake, bags	ton	34.00 –	
Linseed meal, bags	ton	36.00 –	

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.90 –	.95
Cochineal, bags	lb.	.33 –	.35
Cutch, Borneo, bales	lb.	.04½ –	.05
Cutch, Rangoon, bales	lb.	.13 –	.13½
Dextrine, corn, bags 100 lb.		3.69 –	4.01
Dextrine, gum, bags 100 lb.		3.99 –	4.09
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Logwood, sticks	ton	26.00 –	30.00
Logwood, chips, bags	lb.	.02½ –	.03½
Sumac, leaves, Sicily, bags	ton	70.00 –	72.00
Sumac, ground, bags	ton	$65.00 –	$67.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags 100 lb.		2.97 –	3.07
Tapioca flour, bags	lb.	.06 –	.06½

Extracts

Archil, cone., bbl.	lb.	$0.17 –	$0.18
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.08 –	.09
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.04 –	.05
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.10 –	.12
Logwood, crys., bbl.	lb.	.18 –	.20
Logwood, liq., 51°, bbl.	lb.	.09 –	.10
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.05
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07

Dry Colors

Blacks–Carbongas, bags, f.o.b. works	lb.	$0.20 –	$0.24
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.55 –	.60
Prussian, bbl.	lb.	.55 –	.60
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.32 –	.34
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.28 –	.30
Reds, Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.30 –	1.32
Yellow, Chrome, C.P. bbls.	lb.	.20 –	.21
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.30 –	$0.32
Beeswax, crude, bags	lb.	.20 –	.21
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.20½ –	.21½
Carnauba, No. 1, bags	lb.	.42 –	.43
No. 2, North Country, bags	lb.	.23 –	.23½
No. 3, North Country, bags	lb.	.18½ –	.19
Japan, cases	lb.	.15 –	.16
Montan, crude, bags	lb.	.04½ –	.04½
Paraffine, crude, match, 105-110 m.p.	lb.	.04 –	.04½
Crude, scale 124-126 m.p., bags	lb.	.02½ –	.03
Ref., 118-120 m.p., bags	lb.	.03 –	.03½
Ref., 125 m.p., bags	lb.	.03½ –	.03½
Ref, 128-130 m.p., bags	lb.	.03½ –	.03½
Ref., 133-135 m.p., bags	lb.	.04½ –	.04½
Ref., 135-137 m.p., bags	lb.	.05 –	.05½
Stearic acid, agle pressed, bags	lb.	.12½ –	.12½
Double pressed, bags	lb.	.13 –	.13½
Triple pressed, bags	lb.	.14½ –	.14½

Fertilizers

Ammonium sulphate, bulk, f.o.b. works 100 lb.		$3.25 –	$3.30
F.a.s. double bags 100 lb.		3.85 –	3.90
Blood, dried, bulk	unit	4.00 –	
Bone, raw, 3 and 50, ground	ton	27.00 –	30.00
Fish scrap, dom., dried, wks.	unit	3.75 –	
Nitrate of soda, bags 100 lb.		2.45 –	2.52½
Tankage, high grade, f.o.b. Chicago	unit	3.60 –	3.70
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	$4.00 –	$4.50
Tennessee, 78-80%	ton	8.00 –	8.25
Potassium muriate, 80%, bags	ton	34.55 –	
Potassium sulphate, bags basis 90%	ton	43.67 –	
Double manure salt	ton	25.72 –	
Kainit	ton	7.22 –	

Crude Rubber

Para—Upriver fine	lb.	$0.28½ –	
Upriver coarse	lb.	.26 –	
Upriver caucho ball	lb.	.26½ –	
Plantation—First latex crepe	lb.	.27½ –	
Ribbed smoked sheets	lb.	.27½ –	
Brown crepe, thin, clean	lb.	.25½ –	
Amber crepe No. 1	lb.	.27½ –	

Gums

Copal, Congo, amber, bags	lb.	$0.12 –	$0.13
East Indian, bold, bags	lb.	.23 –	.23½
Manila, pale, bags	lb.	.20 –	.20½
Pontinak, No. 1 bags	lb.	.20 –	.20½
Damar, Batavia, cases	lb.	.28 –	.28½
Singapore, No. 1, cases	lb.	.34 –	.35
Singapore, No. 2, cases	lb.	.23 –	.23½
Kauri, No. 1, cases	lb.	.65 –	.67
Ordinary chips, cases	lb.	.21 –	.22
Manjak, Barbados, bags	lb.	.09 –	.09½

Shellac

Shellac, orange fine, bags	lb.	$0.62 –
Orange superfine, bags	lb.	.64 –
A. C. garnet, bags	lb.	nominal
Bleached, bonedry	lb.	.72 –
Bleached, fresh	lb.	.60 –
T. N., bags	lb.	.59 –

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$500.00 –	
Asbestos, shingle, f.o.b., Quebec	sh. ton	$65.00 –	$85.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	28.00 –	
Barytes, crude f.o.b. mines, bulk	net ton	10.00 –	11.00
Casein, bbl., tech.	lb.	.17½ –	.18½
China clay (kaolin) crude, f.o.b. Ga.	net ton	7.00 –	9.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	8.00 –	12.00
Ground, f.o.b. Va.	net ton	14.00 –	20.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	6.00 –	7.00
No. 2 pottery	long ton	4.00 –	5.50
No. 1 soap	long ton	7.00 –	7.50
No. 1 Canadian, f.o.b. mill	long ton	20.00 –	22.00
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06½ –	
Ceylon, chip, bbl.	lb.	.05½ –	
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.14½ –	.15
Gum tragacanth, sorts, bags	lb.	.48 –	.56
No. 1, bags	lb.	1.50 –	1.60
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05½
Dom., ground, bbl.	lb.	.06 –	.07
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50 –	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 –	17.50
Silica, bldg. sand, f.o.b. Pa.	ton	2.00 –	2.75
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags	ton	6.50 –	9.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags	ton	16.00 –	20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.25 –	3.50
Corning	bbl.	1.85 –	
Cabell	bbl.	1.91 –	
Somerset	bbl.	1.75 –	
Illinois	bbl.	1.97 –	
Indiana	bbl.	1.98 –	
Kansas and Oklahoma, 28 deg.	bbl.	1.30 –	
California, 35 deg. and up	bbl.	1.04 –	

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.21½ –	
Naphtha, V. M. & P. deod, steel bbls	gal	.20½ –	
Kerosene, ref. tank wagon	gal.	.14 –	
Bulk, W. W. export	gal.	.07 –	
Lubricating oils:			
Cylinder, Penn., dark	gal.	.20 –	.22
Bloomless, 30@31 grav.	gal.	.18½ –	.20½
Paraffin, pale	gal.	.24 –	.26
Spindle, 200, pale	gal.	.21 –	.22
Petrolatum, amber, bbls	lb.	.05 –	.05½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	ton	$45–50
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40–46
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	36–41
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	42–44
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 6-8% C	lb.	.11½	.11½
4-6% C	lb.	.12 –	.13
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	125.00 –	
Spiegeleisen, 19-21% Mn	gr. ton	40.00 –	
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-15%	gr. ton	48.00 –	50.00
50%	gr. ton	95.00 –	
75%	gr. ton	150.00 –	160.00

Ferrotungsten, 70-80%, per lb. of W	lb.	$0.90 - $0.95
Ferro-uranium, 35-50% of U. per lb. of U	lb.	6.00 -.....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 - 3.75

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$6.00 - $9.00
Chrome ore Calif. concentrates, 50% min. Cr_2O_3.	ton	22.00 - 23.00
C.i.f. Atlantic seaboard	ton	20.50 - 24.00
Coke, fdry., f.o.b. ovens	ton	7.00 - 7.50
Coke, furnace, f.o.b. ovens	ton	6.00 - 6.50
Fluorspar, gravel, f.o.b. mines' Illinois	ton	20.00 - 21.50
Ilmenite, 52% TiO_2	lb.	.01½- .01⅝
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.33 -.....
Manganese ore, chemica (MnO_2)	ton	75.00 - 80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 - .70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 - .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½- .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½- .12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12
Rutile, 95% TiO_2	lb.	.12 -.....
Tungsten, scheelite, 60% WO_3 and over, per unit WO_3	unit	8.50 - 8.75
Tungsten, wolframite, 60% WO_3 and over, per unit WO_3	unit	8.00 - 8.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 - 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 - 2.50
Vanadium pentoxide, 99%	lb.	12.00 - 14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 -.....
Zircon, washed, iron free, f.o.b. Pablo, Fla.	lb.	.04½- .13

Non-Ferrous Materials

	Cents per Lb
Copper, electrolytic	15-15¼
Aluminum, 98 to 99%	25-26
Antimony, wholesale, Chinese and Japanese	6½- 7½
Nickel, virgin metal	27-29
Nickel, ingot and shot	29- ..
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	41.12½
Lead, New York, spot	7.25
Lead, E. St. Louis, spot	7.00
Zinc, spot, New York	6.40
Zinc, spot, E. St. Louis	6.05

Other Metals

Silver (commercial)	oz.	$0.65
Cadmium	lb.	1.00
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	2.65@2.85
Magnesium, ingots, 99%	lb.	1.25-.....
Platinum	oz.	114.00
Iridium	oz.	270.00@280.00
Palladium	oz.	80.00
Mercury	75 lb.	68.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	24.25
Copper bottoms	29.75
Copper rods	25.25
High brass wire	19.37½
High brass rods	17.00
Low brass wire	21.10
Low brass rods	22.00
Brazed brass tubing	24.25
Brazed bronze tubing	29.00
Seamless copper tubing	25.25
Seamless high brass tubing	23.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	11.60@11.8
Copper, heavy and wire	11 50@11.6
Copper, light and bottoms	10.00@10.1
Lead, heavy	5.75@ 6.0
Lead, tea	3.50@ 3.7
Brass, heavy	6.50@ 6.7
Brass, light	5.75@ 6.0
No. 1 yellow brass turnings	6.75@ .70
Zinc	3.75@ 4.2

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.29	$3.14
Soft steel bars	3.19	3.04
Soft steel bar shapes	3.19	3.04
Soft steel bands	3.29	3.19
Plates, ¼ to 1 in. thick	3.29	3.14

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

FLINT—The Southern Rock Asphalt Co., recently formed with a capital of $600,000, has plans under way for the construction of a local refining plant, estimated to cost in excess of $100,000, with machinery. Equipment for asphalt mining will be installed on local property. L. D. Powell is general manager.

BIRMINGHAM—The Murray Tire Co. has work nearing completion on a new plant at 27th Ave. and 26th St., and plans to install machinery and place the works in service at an early date. The company recently increased its capital to $200,000, for expansion.

California

LOS ANGELES—The French China Co., Sebring, O., has preliminary plans under consideration for the construction of a new pottery on site now being selected near Los Angeles, totaling about 100 acres. It will consist of a number of buildings, estimated to cost approximately $1,000,000, with machinery. O. H. Sebring is president.

LONG BEACH—The Specialty Glass Co. is having plans completed for the erection of a new plant on local site, recently purchased. It will cost approximately $45,000. The H. L. Dixon Co., Rosslyn Rd., Pittsburgh, Pa., is engineer.

INDIO—The Interlocking Tile & Sewer Pipe Co., Ontario, Calif., is perfecting plans for the erection of a new plant in the vicinity of Indio, estimated to cost about $75,000. J. F. Gale and D. E. Bulger head the company.

Connecticut

MERIDEN—The Wolf New Process Abrasive Wheel Co., Inc., Hanover St., will break ground at once for the erection of a 1-story addition to its plant. A general contract for the work has been awarded to Lewis A. Miller, Meriden.

WINDSOR LOCKS—C. H. Dexter & Sons, Inc., has broken ground for the construction of a new 4-story and basement building at its paper mill, 55x100 ft. The general contract has been let to the R. G. Bent Co., 83 Ann St., Hartford, Conn. Greenwood & Noerr, 847 Main St., Hartford, are engineers.

Florida

TAMPA—The Roesch Paper Co., Hampton and Franklin Sts., has plans under way for the erection of a new 3-story plant, 100x150 ft., on South Florida Ave., to more than double the capacity of its present plant. It is purposed to remove the existing works to the new location and install considerable additional machinery. Henry Roesch is president.

LEESBURG—The Florida China Clay Co., recently organized, is planning for enlargements in its commercial clay plant to increase the present output of about 50 tons per day. Additional machinery will be installed. J. S. Morris is president and manager, and L. A. Morris, secretary and treasurer.

LAKE CITY—The Lake City Dehydrating Co. is planning for the erection of a new plant, 42x100 ft. A. K. Purdy is president and manager.

Illinois

CHICAGO—The American Linseed Oil Co., 2209 Lumber St., will soon commence the rebuilding of the portion of its plant recently destroyed by fire, to be 4-story, 70x100 ft., estimated to cost $80,000. Francisco & Jacobus, 39 South La Salle St., are architects. R. H. Adams is president.

BLUE ISLAND—Fire, May 30, destroyed a portion of the vat department at the refining plant of the Consumers Oil Co., with loss estimated at $22,000. It is planned to rebuild.

Kansas

COFFEYVILLE—The Sinclair Consolidated Oil Corp., 45 Nassau St., New York, will make extensions and improvements in its local refining plant, including the installation of additional equipment. Enlargements will also be carried out at the oil and gasoline refineries at Kansas City, Kan.; East Chicago, Ind.; Cushing, Okla., and other locations. A new refining plant is now being constructed at Marcus Hook, Pa., and is expected to be ready for service at an early date.

Louisiana

HAMMOND—The Louisiana Utilities Mfg. & Agricultural Co., recently formed with a capital of $1,000,000, has preliminary plans under consideration for the construction of a commercial fertilizer plant, in connection with local utility properties. H. G. Hungate is secretary.

SHREVEPORT—The Henderson Cotton Oil Co. will commence the immediate rebuilding of the portion of its plant, recently destroyed by fire. It will cost close to $25,000.

Maryland

BALTIMORE—The Cast Stone Products Co., 16 South Eutaw St., will commence the erection of a new plant at 3rd and Maryland Aves., Brooklyn district, for the manufacture of blocks, hollow tile and other cast stone specialties.

Massachusetts

WEST SPRINGFIELD—The General Fibre Box Co., Circuit Ave., has awardede a general contract to the Samuel M. Green Co., 293 Bridge St., Springfield, for the construction of a new 1-story building at its plant, 96x100 ft.

Michigan

DETROIT—Berry Brothers, Inc., foot of Leib St., manufacturer of varnishes, oils, etc., has acquired property adjoining its plant, formerly occupied by the Detroit Heating & Lighting Co., and will raze two of the three buildings on the site for the erection of new plant additions. A 4-story extension will be built at once, to be equipped as a color-grinding works. Frederick L. Colby is president, and W. R. Carnegie, vice-president and general manager.

MONROE—The Monroe Board & Lining Co., Barberton, O., has work under way in the first unit of a new mill, 200x300 ft., and plans to occupy the structure at an early date for the manufacture of corrugated board and other paper products. The present Barberton plant will be removed to the new location and additional equipment installed. Other plant units will be built later. William G. Gutmann is president, and J. D. Miller, vice-president, treasurer and general manager.

Nevada

RENO—The Nevada Magnesite Products Co., recently organized, is planning for the construction of a plant for the production of artificial stone products, including tiles, blocks, etc., utilizing magnesite under a special process. A large raw material deposit has been secured about 8 miles from Reno. Charles H. McCarthy is president, and Paul Butler, vice-president.

New Jersey

BEVERLY—The Beverly Wall Paper Co. has plans in progress for the erection of a new 1-story building at its plant, 60x200 ft. Harry G. Aitkin, American Mechanics Bldg., Trenton, N. J., is architect.

LYNDHURST—The Century Cement Products Co. is planning for enlargements in its local plant, to include the installation of additional machinery. The company specializes in the manufacture of blocks, tile and kindred products under a special process. John H. McGuire, Passaic, N. J., mayor of that city, is president and David Slayback, vice-president and treasurer.

New York

PALMYRA—The Palmyra Packing Co., Inc., recently formed with a capital of $100,000, will operate a local plant for the manufacture of rubber, asbestos and other industrial packings. Plans are being arranged for early production. John N. Todd, Canandaigua St., heads the company.

NEW YORK—The American Smelting & Refining Co., 120 Broadway, has tentative plans under way for the construction of coke ovens and a byproducts plant in the vicinity of its properties in the Rosita coalfield, Sabines, State of Coahuila, Mexico. An appropriation of more than $2,500,000 has been arranged for this and other expansion work in that district. The coke production will be used at the company's smelting plants at Chihuahua, Monterey, Asarco and Calientes, Mexico.

PLATTSBURG—A new company is being organized by H. P. O. Newstrand, Greenwich, N. Y., to operate a paper mill at Plattsburg. The former Lezier mill has been acquired and it is purposed to construct a 1-story addition to cost about $75,000.

Ohio

CINCINNATI — The Mammolith Carbon Paint Co., Cincinnati, has been acquired by new interests, headed by J. H. Kresge, Pittsburgh, Pa., for a consideration said to be about $300,000. The new company has plans for extensions and improvements for larger capacity. The carbon mines in Arkansas, also purchased, will be expanded.

COLUMBUS—The Brocalsa Chemical Co. has plans in progress for extensions and improvements in its plant and properties at Syracuse, O., and vicinity. Additional equipment will be installed. The company is arranging for a bond issue of $500,000, a portion of the proceeds to be used for the expansion.

LOWELLVILLE—The Grasselli Powder Co. has plans under consideration for the rebuilding of the portion of its local plant, including press and corning mills, destroyed by fire, June 6. An official estimate of loss has not been announced. Headquarters of the company are in the Guardian Bldg., Cleveland, O.

NORTH INDUSTRY—The Stark Oil Refining Co., 1110 George D. Harter Bank Bldg., Canton, O., has plans in progress for the erection of a new local oil-refining plant, estimated to cost approximately $350,000, including equipment. Edward Reiser heads the company. Walter Cross, Kansas City, Mo., is engineer.

Oregon

SALEM—The Oregon Pulp & Paper Co. will take bids at once for the erection of a 2-story addition to its mill, 128x220 ft., estimated to cost about $100,000, including equipment. Knighton & Howell, United States National Bank Bldg., Portland, are architects.

Pennsylvania

BRISTOL—The Paterson Parchment Paper Co., Modena, Pa., has construction under way on a new local mill, to comprise about 5 acres of floor space, estimated to cost close to $2,000,000, with machinery. To provide for a portion of the work, the company is disposing of a bond issue of $1,500,000. A plant is now being operated at Modena, and a parchmentizing mill at Passaic, N. J. It is purposed to double the present output. William F. Brunner is president.

PITTSBURGH—The Pennzoil Co., Oil City, Pa., formerly known as the Oil City Oil & Grease Co., has leased a building at 1739 Penn Ave. for a term of years, for the establishment of a new oil storage and distributing plant.

Tennessee

CLEVELAND—The Manufacturers' Soap & Chemical Co., recently organized with a capital of $50,000, has plans under way for the erection of a new 3-story plant for the manufacture of soaps, washing powders, etc. George S. Hardwick, Sr., is president.

Texas

HOUSTON—The Board of Directors, Rice Institute, will soon take bids for the construction of a new chemical laboratory at the institution, to be 3-story and basement, estimated to cost about $375,000. Twelve large laboratories will be installed, and sixteen smaller laboratories and research rooms. William Ward Watkin, Houston, is architect.

FORT WORTH—The Texas Steel Co., lately formed with a capital of $5,000,000, to take over and operate the local plant of the Armstrong Steel Co., will remodel and extend the works, providing an electric furnace department, steel and iron casting plant and steel bar mill. John H. Kirby, Houston, Tex., heads the new organization.

Vermont

SHELDON SPRINGS—The Missisquoi Pulp & Paper Co. has commenced the construction of a new unit at its local mill for considerable increase in capacity. Additional machinery will be installed and a power plant erected. The expansion is estimated to cost in excess of $400,000. The company specializes in the manufacture of bristol board.

West Virginia

WELLSBURG—The Specialty Glass Co., recently organized with a capital of $100,000, has plans under way for the erection of a new plant for the manufacture of a line of glass products, for which a local site will soon be selected. It is estimated to cost about $65,000, and is expected to be ready for service by the close of the year. The new company is headed by A. L. Rowing, Wellsburg; John N. Dean and A. E. Bowlder, Wheeling, W. Va.

Wisconsin

MANITOWOC — The Manitowoc Portland Cement Co., a subsidiary of the Newaygo Portland Cement Co., Newaygo, Mich., has plans nearing completion for the erection of a new cement mill on local site, consisting of a number of buildings, equipped for a capacity of 3,000 bbl. per day. It is estimated to cost approximately $1,500,000. To provide funds, the parent organization is disposing of a bond issue in the amount noted. Clay H. Hollister is president.

New Companies

BADER CHEMICAL CO., Passaic, N. J.; chemicals and chemical byproducts; $100,000. Incorporators: John Bader, Hans O. Hirsch and E. J. Zillessen, 353 Van Houten Ave., Passaic.

FLORIDA EAST COAST FERTILIZER CO., Miami, Fla.; fertilizer products; $200,000. M. C. Alford is president, and Thomas B. Nuttall, secretary, both of Miami.

ATLANTIC INDUSTRIAL ALCOHOL CO., Richmond, S. I., N. Y.; industrial alcohol and kindred products; $400,000. Incorporators: G. R. Franklin, F. T. Davis and M. E. Muniz. Representative: Bush & Crawford, 30 Broad St., New York.

LEA OIL CO., Boston, Mass.; refined oil products; 1,000 shares of stock, no par value. Arthur F. Ray is president, and Charles F. Dutch, 4 Brook St., Winchester, Mass., treasurer.

CENTRAL STEEL TREATING CO., Detroit, Mich.; heat-treating and hardening metals; $10,000. Incorporators: Karl B. Goddard, James I. McClintock and L. C. Dunn, 5324 Burns Ave., Detroit.

CITIZENS WINDOW GLASS CO., New Bethlehem, Pa.; glass products; $1,000,000. H. E. Andrews, New Bethlehem, is treasurer.

CRESCENT OIL CO., Martindale, Tex.; refined petroleum products; $50,000. Incorporators: R. E. Martindale, M. E. Barrow and E. L. Crook, all of Martindale.

GABIS OIL & CHEMICAL CORP., Linden, N. J.; chemicals, oils and kindred products; $25,000. Incorporators: A. J. David, M. S. Graff and Hyman Rosenfeld, Linden. The last noted is representative.

NORTH AMERICAN CHEMICAL CORP., New York, N. Y.; chemicals and chemical byproducts; $7,500,000. Incorporators: Maurice E. Davis, Ernest G. Metcalfe and Gotthilf Lehmann. Representative: United States Corporation Co., 65 Cedar St.

SAGADAHOC FERTILIZER CO., Bowdoinham, Me.; fertilizers and chemical products; $150,000. Horace S. Dodge, president and treasurer; and C. L. Andrews, Bowdoinham, clerk and representative.

MEMPHIS OXYGEN CO., Memphis, Tenn.; industrial oxygen products; $75,000. Incorporators: C. H. Reynoll, L. B. Lovitt and R. S. Polk, all of Memphis.

MACARTHUR MFG. CO., Seattle, Wash.; oil products; $100,000. William MacArthur, 521 Lyon Bldg., Seattle, heads the company.

FLAMINGO SUGAR MILLS, INC., Philadelphia, Pa.; construct and operate sugar mills; $100,000. A. W. Howe, Jr., 2032 De Lancey St., Philadelphia, is treasurer.

PAPER MILLS CORP., Wilmington, Del.; paper products, cardboard, etc.; $5,000,000. Representative: Corporation Trust Co. of American, du Pont Bldg., Wilmington.

TROMITE CORP., Carteret, N. J.; soap and kindred products; organized. Plumer Wheeler and Louis Neuberg, Carteret, head the company.

PIGMY CORP., Marion, Ky.; to operate fluorspar properties and reduction mills; $20,000. Incorporators: George B. Fraser and F. H. Burgher, Washington, Ky.; and C. S. Nunn, Marion.

CHEMICAL SUPPLY CO., 5 Mount Vernon St., Providence, R. I.; chemicals and chemical byproducts; organized. Philip W. Lown heads the company.

EAST COAST OIL CO., Jacksonville, Fla.; refined petroleum products; $500,000. Incorporators: George B. Monroe and D. M. Anderson, both of Jacksonville.

FREEDOM PAPER CO., New York, N. Y.; paper products; $45,000. Incorporators: B. Friedland and M. Schlanger. Representative: Isidore Lowenbraun, 116 Nassau St., New York.

CREZOIN CHEMICAL CORP., Camden, N. J.; chemicals and chemical byproducts; $250,000. Incorporators: Francis J. D. Barry, William B. and J. Benton Childers. Representative: Adam R. Sloan, 531 Federal St., Camden.

TEXAS CARBON INDUSTRIES, INC., Wilmington, Del.; carbon and oil products; $650,000. Representative: Corporation Trust Co. of American, du Pont Bldg., Wilmington.

ATBLAKE LABORATORIES, INC., Syracuse, N. Y.; chemicals and chemical byproducts; $25,000. Incorporators: J. G. Blakeney, H. V. Curtiss and J. S. Atkins. Representative: George W. O'Brien, The Bastable, Syracuse.

Industrial Notes

THE HERCULES POWDER CO. announces the removal of its San Francisco office to the New Standard Oil Bldg., Bush and Sansom Sts.

THE B. F. STURTEVANT CO., Hyde Park, Boston, Mass., announces that due to increased business and the desire to be of greater service to its customers, it has purchased the plant of the Wisconsin Engine Co., maker of Corliss pumping engines at Corliss, Wis. This new acquisition covers nearly 10 acres and the buildings have approximately 150,000 sq.ft. of floor space. A full manufacturing and engineering staff will be maintained and closer co-operation given to Western customers. The new plant will be under the same direction as the other factories at Hyde Park, Galt, San Francisco and Philadelphia, with ex-Governor E. N. Foss as president. Harry W. Page has been selected as general manager and will be in entire charge of the Wisconsin plant.

THE PENNSYLVANIA CRUSHER CO., Philadelphia, Pa., in order to provide more adequate facilities for its business in the Pittsburgh district, has moved the offices from the Peoples Bank Bldg., to the Oliver Bldg., where operations will be continued under the management of H. M. Hallett.

R. M. SISK, vice-president and assistant treasurer of the Sharpsville Boiler Works Co., Sharpsville, Pa., recently severed his connection with that company and has not yet announced his plans for the future.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

BLACK DECOLORANT for bleaching. Turin, Italy. Agency.—6792.

CHEMICALS, OILS AND GREASES. Valparaiso, Chile. Agency.—6765.

DYES. Valparaiso, Chile. Agency.—6765.

PAINTS AND VARNISHES. Valparaiso, Chile. Agency.—6765.

LINSEED CAKE. Hamburg, Germany. Agency.—6756.

CASEIN. Dublin, Ireland. Purchase.—6744.

COCONUT OIL. 100,000 lb. Manzanillo, Mexico. Purchase.—6720.

GLUCOSE. Saloniki, Greece. Purchase.—6755.